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TREATMENT OF TUBERCULOSIS*

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Miami.

Tuberculosis is one of the few diseases which we expect to cure by what seem comparatively slight or unimportant remedial measures. In this disease we prescribe, not medicines, but a mode of life. We have no specific drugs or sera for the cure of tuberculosis, so must depend on building up constitutional resistance.

The tubercle is the lesion of tuberculosis, and a brief consideration of its pathology will help us to understand the significance of our principal remedy, which is rest. In the tubercle, we have a caseous centre surrounded by endothelial cells, and again surrounded by layers of fibrous tissue. Poisonous products which result from disentegration of this caseous centre are carried out by the lymph stream and give us our symptoms or reactions. Healing takes place by the formation of sufficient fibrous tissue to wall off completely this caseous centre and keep the poisonous products from getting out. In active or progressive tuberculosis, the lesion is becoming caseous in the centre faster than the fibrous tissue can build a wall around it. Now let us consider what will best promote the formation of this fibrous tissue and what will retard it. It has been found that the cells surrounding a tubercle become sensitized to toxines of the bacillus so that very minute doses have the effect of causing inflammation and giving us a focal reaction. Movement of the body causes a change in osmotic pressure, which lets out these poisonous products, hence we must have rest. Along with this rest must be good food, fresh air, a contented mind, and a determination to get well.

The cure of tuberculosis may be divided under three heads:

1. Relief of symptoms and complications.
2. Constitutional treatment or building up of the patient.
3. The cure of the local lesion.

It is for the first of these, the relief of symptoms, that the average patient comes to the physician and demands relief. He wants relief from his cough, his loss of weight, loss of appetite, and other intestinal disturbances; from his night sweats, and feeling of tiredness. The physician who attempts to relieve these conditions by cough medicines and tonics, is treating symptoms and complications and not the disease.

If at this time the patient can be made to understand that the symptoms he complains of can be relieved by rest, good food, etc., and can be induced to undertake treatment, he is at the beginning of his second stage of the cure, namely, constitutional treatment, and this, if carried out sufficiently, will result in the healing of the local lesion, which is, of course, our goal.

Any tuberculosis patient will do better and get well faster if he can live at a sanatorium for at least three months. The average patient does not know how to rest. When he goes to a sanatorium, he is surprised to see that what he considers resting is looked upon by his fellow patients as taking considerable exercise. It may be said that every patient who comes to a physician's office and is diagnosed tuberculosis, needs bed care. In an early case, this may be for a month or two only. The patient should have explained to him as much of the pathology of his condition as his mind can assimilate. It is always a mistake to hide from the patient the true condition of his lungs, as this will inevitably lengthen his course of treatment, or shorten his life. Also, in many cases, this harms the physician's reputation, for, if the physician does not impress on the patient the full need of long continued rest, he cannot hope to get results from the symptomatic treatment he is forced to prescribe. Eventually, the patient is dissatisfied because he is not getting well and goes to another physician, who diagnoses his condition as tuberculosis. Then this patient blames the first doctor for a mistake in diagnosis.

Fundamentally, the more the patient with active tuberculosis will rest, the more quickly he will have his disease arrested. He will improve faster if he is kept in bed for twenty-four hours a day, using bed pan and urinal; he will improve faster if he does not sit up in bed or read or write letters or play cards or have visitors, or smoke. Smoking may not be definitely harmful to the lungs, but it does destroy the appetite and irritate the throat.

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The patient should have a bed on a screened south or east porch; the only protection needed in Florida being against blowing rain. This may be achieved by canvas curtains.

Now, we all know that many patients cannot be made to follow this Spartan routine, but it is the physician's duty to tell the patient of every measure that will speed up his recovery, and let the patient follow as closely as his temperament and environment will allow. It is very important that the physician outline a definite daily program even for a strictly bed patient. There should be a certain hour for meals, for reading, for absolute relaxation and for sleep. This routine should be adhered to strictly and not in a haphazard fashion. The patient will have more confidence in his physician if the physician is definite in his instructions.

Food.—The idea that a patient with tuberculosis should be made to eat all that can be stuffed into him is no longer held. The stomach is the organ of the body on which we depend for assimilating the material which will build the fibrous wall around his lesion. It is supremely important, then, that his digestion be kept as nearly perfect as possible. Rest is a great tonic in tuberculosis, as toxines circulating in the blood destroy the appetite. After a patient has rested for a few days in bed, gets his temperature down to nearly normal, and has meals regularly on the minute his appetite will be such that three good meals a day, with a glass of milk at bedtime, are sufficient to nourish his body and give him plenty of reserve to cause a gain in weight. Do not pamper the appetite too much. The food should be well cooked and wholesome and should be served as attractively as possible. It is preeminently important to keep the stomach working well. This sometimes forbids the use of such medicines as creosote and codliver oil. Preparations of these substances may be given with good effect in many cases, but they should not be used at the expense of deranging the digestion.

Digestive Disturbances.—In many cases these are due to an excess of toxines circulating in the body. In other cases, however, and more often than we imagine, they are due to intestinal tuberculosis, even in moderately advanced cases. Tuberculosis of the small bowel usually causes anorexia and constipation. Tuberculosis of the large bowel causes diarrhœa. For constipation, the regular use of medicinal laxatives should be discouraged. Shredded agar and mineral oil act mechanically, and are the best remedies for constipation. They may be taken routinely for long periods without damage. Continued frequent use of enemas is not wise. For diarrhoea from intestinal tuberculosis, there is not much in the way of medication. Strong astringent drugs are not to be advised. Calcium carbonate, grs. 30 t.i.d., is sometimes useful. Calcium chloride intravenously has been helpful at times. Ultra violet lamp is probably our best remedy. Paregoric with the calcium carbonate should be used for cramping pains.

Medicines.—Routine medication is not necessary. Cough medicines should be used sparingly, if at all, and only when actually needed, as in irritation of the throat. The patient should be encouraged to suppress non-productive cough. He can be trained to allow his secretions to accumulate in the throat when they may be coughed up with minimum effort. An irritable cough may be relieved by lozenges as peppermint or mild aromatic medicated syrups. Sipping hot water will often stop a coughing spell. Iced drinks, ice cream, acids and pickles, on the contrary, are apt to produce attacks of coughing.

Exercise.—When a patient is free from temperatures, gaining weight, and feeling rested, the critical time in his treatment has arrived. He feels that he is well and cannot see any reason for staying in bed. He wants to take a chance. It is at this time that the condition of his tubercle should again be explained to him. At this period, he has a fibrous wall around his tubercle, which is keeping in the toxines. Graduated exercise is equivalent to a dose of tuberculin, and it should be so supervised that he gets just enough to stimulate the formation of more tissue but not enough to poison the cells already formed and cause them to break down. If a patient up to this time has been a twenty-four-hour bed patient, he may be allowed to sit in a chair for say fifteen minutes for a few days. This period may be gradually increased. Later, he may take five minutes additional walking exercise. During this testing out period, the pulse and temperature should be closely watched and the physician should be guided by these in increasing exercise. Exercise may be increased to two, four or six hours a day but should be taken as a prescription, regularly, and with due regard to the patient's physical improvement. Danger signals are increased cough, tiredness, loss of weight, temperature and appearance of not doing well, as well as increase of signs on the chest.

There are some complications which may not be discussed fully in this paper. Hemorrhage should be treated by absolute rest with codine or heroin. Morphine is not recommended. Liquid diet should be given for a week after the hemorrhage ceases and perhaps pneumothorax may be indicated. Calcium chloride intravenously has been of value in stopping hemorrhage.

Hoarseness and loss of voice are signs of beginning throat involvement. Tuberculosis of the throat is best treated by whispering or absolute silence, the patient using pad and pencil to make his wants known.

In tuberculosis of the testicle, the organ should not be removed. Sun or ultra violet lamp should be used. A tuberculous eye should never be removed. It may get well, or at least become quiescent.

Heliotherapy.—Much has been said of the healing quality of the sun's rays. Certainly sun treatment is of benefit, but should not be used indiscriminately. Patients with active pulmonary tuberculosis as a rule should not be given heliotherapy or if it is given, it should be used very cautiously, to be sure that it is not increasing the symptoms. In tuberculosis of the eye, throat, testicle and glands, heliotherapy has been found of much value, but should always be used under the watchful care of a physician familiar with its effects. In other words, heliotherapy is of more value in non-pulmonary than in pulmonary tuberculosis.

Contacts.—No plan of home treatment is complete that does not offer thorough consideration of all the other inmates, both children and adults. Every contact who has lived in the same house with a patient suffering from active tuberculosis should have a thorough physical examination with X-ray when necessary. Every child contact should have repeated examinations and his health should be carefully watched during childhood and up to adult life.

Tuberculosis can be cured if treatment is begun early and continued long enough. The patient must cooperate. The physician should instruct the patient in the facts regarding his disease.

Do not be in a hurry to discharge a patient as needing no further advice. An arrested case of tuberculosis should have medical advice for years. He should be warned to fear a cold and go to bed when he gets one. He should keep his weight a little above normal. He should be watched so that he will not let his enthusiasm cause a set-back.

We must care for the tuberculosis patient at the right time and in the right way until he is cured, instead of at the wrong time and in the wrong way until he is dead.

DISCUSSION.

Dr. R. H. McGinnis, Jacksonville:

I want to stress what has been said in this paper about home treatment. Most of the cases of tuberculosis are necessarily treated in the home. Regarding what the essayist has said about treatment in the home, it is only necessary to stress the need of good food, of rest and of plenty of fresh air, and I would add one other thing, and that is wholesome surroundings.

The treatment of every tuberculous patient should be outlined in detail, the individual characteristics considered and evaluated. His surroundings should be made attractive, restful, cheerful, with attendants who offer encouragement, sympathy, love. Nowhere does one obtain love and devotion to a greater degree than in the home. Rest and exercise must be regulated by the physician according to the quantity and quality of the pathology present.

Dr. Marvin Smith, Miami:

I do not treat tuberculosis, except where occasionally a case of gastro-intestinal disease occurs in connection with it. Until a few years ago, tuberculosis caused more deaths than any other known disease, but within the last three years, cardio-renal-vascular disease has stepped up and taken first place.

I appreciate the paper of Dr. Claxton. He touched a question that is, I think, of great importance, and that is the problem of feeding the tuberculous patient. One danger is in giving the patient too much food and another is in not giving sufficient to enable him to overcome the destructive processes that are going on. Then again the selection of the items of food is an essential factor. This brings us at once to the necessity of knowing what the chemistry of the stomach is, in each individual case, before we can intelligently lay out a dietary regime that will fit it and bring about the results that we wish. It is my belief that many failures in treating this disease result from improper management of the diet, overfeeding, etc. I happened to be in a physician's office one day when a patient came in that was being treated for tuberculosis. The physician asked the patient how

he was getting on with those nine eggs a day and the patient replied: "Doctor, I can't eat nine eggs a day." "Yes," the physician said, "but you must eat nine eggs a day, as your recovery depends upon taking good wholesome food." Both the physician and the patient told the truth, but the amount of food was certainly too great.

If we can get the tuberculosis patient before his condition is too far advanced, I do not believe it is unwise to subject him to a gastric test and find out just what his digestive ability is; then we will know how much and what kind of food to recommend and whether the digestive enzymes need to be supplemented.

Dr. W. A. Claxton, Miami (closing):

I was very glad to hear the discussion which has taken place. I think all realize that tuberculosis is an important disease, and a disease that should be considered as such by all. There is nothing further I will add except to stress the point about individual treatment; that is, the individuality of the patient. A lesion that might in three-fourths of the cases find the patient able to be around, might in one-fourth require that he be in bed. This is because of the difference in resistance. As a general rule in lesions of equal extent, the longer the patient has the disease, the better the resistance, and, therefore, the prognosis.

BRILL'S DISEASE–SPORADIC TYPHUS*

A Report of Two Cases

T. H. Bates, M.D.,
Lake City.

Dr. Nathan E. Brill (1898-1910-1911), of New York, called attention in 1910 to a typhus-like disease occurring endemically in that city. Because of its generally milder course and its occurrence under circumstances different from those seen in typhus, he hesitated to identify it as such. Accordingly he believed that he was dealing with a new clinical entity, "an infectious disease of unknown etiology." Cases of this type have since been known in the United States as "Brill's disease."

In 1912, Anderson and Goldberger, who had previously reported on the experimental transmission of Mexican typhus (tabardillo) to monkeys, were similarly successful in the inoculation of a Rhesus monkey with blood from a case of Brill's disease in New York. They found that as in tabardillo, one infection rendered monkeys immune to subsequent inoculations of the same passage virus. Monkeys previously infected with Mexican typhus were found to be immune to inoculation with Brill's, while those previously infected with Brill's were immune to Mexican typhus. From these observations, they concluded that Brill's disease was, in fact, identical with typhus fever and this conclusion seems to have been quite promptly accepted by the medical profession in general.

During the year or so following, due to the interest stimulated by these two publications, a number of reports of the occurrence of cases similar to those described by Brill, appeared in American Medical literature. In addition to these, and since that time cases of clinical typhus have continued to be reported to the United States Public Health Service, each year from various parts of the United States, but particularly along the Atlantic seaboard and those states along the Mexican border.

A certain portion of these have been imported or traceable to infection recently imported from foreign sources. Such cases have presented the epidemiological picture usually associated with typhus as known in Europe. For instance, on the fairly numerous occasions when typhus has been introduced from Mexico in the last ten years (Pierce, 1917; Boyd, 1917; Cumming and Senfter, 1917; Armstrong, 1922; Tappan, 1926) the disease has been virulent, the mortality high and the cases have been in persons obviously lousy or those in contact with them.

On the other hand, there have been a large number of sporadic cases of mild typhus, which could not be traced to recent importation and occurring under circumstances which strongly suggested local origin of the infection. In regard to this so-called endemic or sporadic typhus, Brill originally noted that the epidemiology presented points of difference from that generally assigned to typhus. He pointed out that the cases occurred sporadically, without traceable connection with each other, that they seldom, if ever, gave rise to new cases among those in contact with the sick person, that no localized outbreaks occurred, and finally that their seasonal distribution differed from that of typhus.

In 1922, while detailed as acting State epidemiologist to the State Board of Health of Alabama, Dr. K. F. Maxcy had occasion to observe a number of cases which were identified

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clinically as the endemic form of typhus described by Brill and which gave a positive Weil-Felix blood serum reaction. Maxcy and Havens undertook an epidemiological survey with the result that it was discovered that sporadic typhus was present not only in Alabama, but in Georgia, North and South Carolina and Florida in sufficient numbers to make it worth our while to become familiar with the diagnosis and recognition of the diseases. The first report of Brill's disease in this section of the country was that of Paullin in 1913, in which he described the clinical course of six cases seen by him in Atlanta, Ga. . In 1914 Newell and Allen reported four cases in Charlotte, N. C. In a later report Allen in 1923 reported in detail twenty-four cases, none of which had contact with any other case in the series. Smith of the Charleston, South Carolina, Board of Health reported some fifteen cases occurring there in 1922-1925, while cases have been reported from a number of towns in Georgia and Alabama. During 1926 there were reported to the Alabama State Board of Health forty-eight cases, while in 1927 there were sixty-nine cases. Seventy-five cases were reported to the Georgia State Board of Health in 1927 in addition to 72 cases that occurred in Savannah where there were six deaths. For some years an occasional case of typhus has been reported in Jacksonville and reports of cases in Tampa, Dunedin, Jensen, St. Petersburg, Callahan, Lakeland, Orlando, West Tampa, Pensacola and Ybor City have been made in the past few years.

My personal interest in the subject of Brill's was aroused when the Bureau of Communicable Diseases of the State Board of Health questioned my diagnosis of a case which I had reported to the Bureau of Vital Statistics. I have since been convinced that my original diagnosis of paratyphoid was in error and in the face of a positive Weil-Felix reaction reported from two widely separated laboratories have had to admit a diagnosis of Brill's disease or sporadic typhus.

Briefly I want to give you the case histories:

Case 1, C. J. H., young white man, aged thirty, city salesman for wholesale grocer, September 23, 1927, in the forenoon felt chilly and ached, played golf in the afternoon hoping to feel better by getting out in the open and away from work. Next evening still feeling bad, discovered that he had fever. When seen about 8 p. m., face was flushed, eyes injected, tongue dry and coated, temperature 101.6, pulse 100, respiration 20, throat slightly red, chest, abdomen and extremities negative; complained of some headache. Patient had taken quinine, so no blood smear was made on first examination. Symptomatic treatment was instituted and a policy of watchful waiting pursued. Two days later, on the fourth day of illness, a few very distinct pink macules the size of a pin-head were noticed over the lower part of the chest and upper portion of the abdomen. Blood smear taken on this date was reported negative for malaria-typhoid, paratyphoid and typhus. Specimens were taken at two-day intervals, all of which were reported negative until the tenth day when a "positive for typhus" report was made. During this time, the patient ran a temperature from 101 to 103 continuously, was quite constipated, very drowsy and developed a moderately thick crop of red macules about the size of a pin-head which were most marked on the lower chest and along the upper part of the abdomen and along the sides of same. A few were seen on the forearm on the flexor surface. Medicine had little or no effect on the temperature. On the fourteenth day the temperature was noticeably lower, and on the fifteenth reached normal and did not become elevated again. During the course of the disease the urine was examined several times and only during the period of high fever did it show a trace of albumen. Blood positive Weil-Felix three weeks after temperature became normal.

Case 2. White man aged thirty-two, electrician, became ill October 14, 1927. Chill followed by fever 102, severe headache and general malaise, and marked constipation. Blood was negative for malaria and typhoid and paratyphoid. On the fourth or fifth day there appeared a very marked red slightly elevated macular eruption scattered over the trunk of body and flexor surface of arms and legs. The temperature remained high, 102 to 104 for fourteen days when it came down quite rapidly and did not become elevated again. Three weeks later the blood gave a positive Weil-Felix reaction, convalescence rapid. In both these cases it was noted that medicine had little or no effect on the course of the disease and very little effect on the symptoms. The diagnosis was finally made positive by the Weil-Felix reaction, which, coupled with the clinical picture, left no doubt on my mind as to the correctness of the diagnosis.

In conclusion, I wish to call your attention to the accompanying charts: Chart 1 shows the comparative seasonal incidence of the old world typhus as seen in Roumania during the period 1922-1925, as reported through the League of Nations, and that of sporadic typhus or Brill's disease as seen in the Southeastern United States in the same period; Chart 2 shows a similar comparison with the cases occurring in Florida during 1926-1927. These comparisons show definitely the difference in seasonal occurrence of the sporadic and epidemic types of typhus.

For the purpose of calling your attention to the increasing frequence of Brill's disease in Florida and the neighboring states the following maps are presented: A, showing the location of the typhus reported in Florida in 1926; B, showing the location of cases in 1927, and C, showing the location of the cases reported in Alabama, Georgia, South Carolina, North Carolina and Florida during the past few years (1922-1925).

My thanks are due Drs. F. A. Brink and Stewart G. Thompson of the Florida State Board of Health, Dr. T. F. Sellers of the Georgia State Board of Health, and Dr. D. G. Gill of the Alabama State Board of Health for valuable statistical data herein used, and to Dr. Elinor Harthill, Dr. Geo. F. Klugh and Miss Pearl Griffith for their careful laboratory examination, and Miss Nan Norris for her unfailing assistance in the preparation of the text.

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DISCUSSION.

Dr. F. A. Brink:

There are many differences between Brill's disease on the one hand and the old world typhus and Mexican tabardillo on the other. I want to review these points and emphasize them. The seasonal difference is especially significant. The old world type occurs in the winter season when people are crowded together for warmth and sewed up in their winter garments, giving opportunity for propagation of lice which are well known to transmit the infection, whereas in the endemic type, we very seldom find a condition where the patient is infested with lice and for the most part the patients are cleanly and well-to-do. The absence of contact infection is very noticeable in this type. From Brill's disease, attending physicians, nurses, hospital orderlies and other contacts are almost entirely immune, so immune that secondary cases are seldom seen.

The clinical manifestations of the disease might be dwelt on for a moment. In typhus, the onset is a little more sudden than in typhoid, and the recovery is quicker. The eruption is usually quite characteristic—at first maculopapular and becoming petechial.

There is very little known about the epidemiology of Brill's disease. The most outstanding thing is the fact that a large number of the patients have been employed in food depots, grocery stores and stock feed establishments. Negroes seem to be immune. I think there is perhaps only one case of Brill's disease reported in Florida in a negro.

I would like to discuss in closing the importance of considering the possibility of Brill's disease when one sees those cases that resemble

typhoid fever but which do not correspond entirely with the clinical characteristics of typhoid or agglutinate the typhoid bacillus. The State Board of Health Laboratory makes examinations on request. Fresh cultures of the bacillus can be made up at any time and the laboratory people are glad to make these tests. The first case that Dr. Bates called to your attention was recognized because the reaction was done not on account of any suspicion of Brill's disease, but because it happened to come in when somebody else had requested a test and Dr. Bates' specimen, sent in for the Widal, was run as a control.

We are very anxious to have reports of cases that are suspicious because of the fact that so little is known about the epidemiology of this disease. I would like to know about other cases that have occurred. Dr. Maxcy of the U. S. Public Health Service, having heard of the cases reported in this paper, will make a study of the disease during the coming summer.

Dr. E. C. Levy, Tampa:

In the early nineties true typhus fever was introduced into New York City and a number of secondary cases developed in the tenement sections. Many of these were treated at Mount Sinai Hospital, where I happened to be interne. Later, as Chief Health Officer of Richmond, I saw a number of sporadic cases, and during the past year (1927), as City Health Officer of Tampa, I have observed 29 more cases. What I shall have to say will be based largely on my personal experience.

Having a most wholesome dread of typhus, based on its history as one of the five major epidemic diseases, whenever we had a suspicious case in Richmond we at once wired the U. S. Public Health Service and Dr. Goldberger usually came within a few hours. All these cases were very mild, all were among white adults and all recovered. They were distinctly sporadic, without evidence of connection between any two of the cases.

The incidence of our Tampa cases during 1927 was as follows: January, 1; February, 1; April, 2; June, 4; July, 8; August, 8; September, 4; and October, 1—a total of 29 cases for the year.

All the cases were among whites, with a large proportion among the Cuban population. There were no young children. In no instance was there either history or evidence of lice. The homes, with very few exceptions, were of the average middle class. The cases were widely separated geographically. There had been no previous intimacy between the patients or their families. Three of the cases worked in one of our cigar factories, but this was an establishment employing over 1,000 persons, so this was without significance. In no way was there any suggestion of direct contagion. All recovered except one, and here death was due to chronic heart and Bright's disease in a middle-aged man. In all cases except one (the fatal case, which died too early) a positive Weil-Felix agglutination test was secured.

Our 29 cases were reported by ten physicians. One doctor reported 7 cases, another 6, two others 4 each, another 3, and five doctors reported 1 case each. Moreover, the three doctors who reported 7, 6 and 4 cases respectively were a father, his son, and another doctor in close association with them. These men naturally discussed typhus a great deal among themselves and were constantly on the lookout for it. These facts inevitably suggest that if all our Tampa doctors had been equally alert many more cases would have been recognized and reported.

Just a word as to diagnosis. The onset is sudden, with severe headache and backache and high fever. There is extreme prostration. The patient takes to bed from the start. I have been particularly impressed by the deep, purplish flush of the face and the very congested eyes. These strongly remind one of measles at first glance. These symptoms, especially if the patient is a white adult and if the case is seen in the summer months, should always suggest Brill's disease. Later the eruption will appear.

The laboratory will be of help after about the tenth day. Agglutination of Proteus X 19, in dilutions of 160 or higher, is considered positive. If daily specimens are taken and blood that originally was negative becomes positive in 1 to 20 and then in 1 to 40 and then 1 to 80, this would be considered positive before it agglutinated in 1 to 160.

We cannot help being somewhat anxious as to whether this mild type of typhus, or Brill's disease, will build up in virulence year by year. Heretofore most of the deaths have been among older people with heart and Bright's disease, but last year, I am informed by Dr. V. H. Bassett, Health Officer of Savannah, there were two deaths in that city, a father and son, in previously well persons who quickly succumbed to a fulmi-

nant type of the disease, in every way identical with old world typhus.

We cannot but be puzzled by the seasonal distribution of Brill's disease, reaching its peak in the late summer, while old world typhus is largely a disease of cold weather. Absence of the louse in our mild form of the disease and its prominence in classical typhus is another puzzling point. These two points of difference suggest the possibility that, after all, we are not dealing with a mild form of true typhus. On the other hand, the symptomatology, the mutual immunity and the agglutination of Proteus X 19 in both forms makes this possibility very remote. It must be remembered, however, that the agglutination test is made with a saprophytic organism admittedly not the cause of typhus or Brill's.

Dr. W. A. Claxton, Miami:

In Miami we had a few cases in which we couldn't agree on the diagnosis and after wondering what these cases were, we procured Brucella Abortis, Melitensis, and Proteus X with a view to trying to find out, and we thought maybe it was B. Abortis or Malta Fever, but we didn't find this. We found one case that agglutinated to Proteus X about three weeks after he had apparently recovered, but it gave a very good reaction.

Dr. C. W. Bartlett, Tampa:

Several of these cases were in my own practice. The majority of the cases called to your attention by Dr. Levy were reported by a group of doctors who would get together practically every day and talk their cases over and therefore they were on the lookout for this disease.

I believe the reason why more cases were not reported was because the other doctors were not on the lookout for them. I believe it would be a good idea in all cases where we fail to get the Widal reaction to test for typhus fever. As the group above stated used to do this, many of their cases were found on blood examination to give a positive Weil-Felix.

I was called to see many of these cases, which, from the treatment and statement of the family, the physician in charge thought was typhoid fever.

Dr. W. P. Dickinson, Lakeland:

What I would like to hear now would be the management of these cases, how these cases are handled, and what has been done for them.

Dr. T. H. Bates, Lake City (closing):

I appreciate the discussion of this paper, and I think it is time interest in this disease was aroused. I had a case in which I filled out the report card as paratyphoid and submitted it to the Bureau of Communicable Diseases, who in turn called it typhus, to which I replied, "this man has no more typhus than you have." The State Board of Health sent Dr. Brink out to see if we could arrive at some conclusion. That is why I was keenly interested in taking up the second case which occurred just a couple of weeks or three weeks later.

As to management of the case, as the Doctor has requested, I would say that medication has absolutely no effect on the course of the disease. Hydrotherapy for high temperature in such cases and such analgesics as might suggest themselves to relieve pain was all that was used with any noticeable effect. I don't think there is any specific treatment for it. On the 14th day you will get a drop in temperature, and following that he will recover very rapidly. Referring to cases reported from Savannah, I might say there has been a very sharp increase in the cases reported there, 40 in 1926 and 72 in 1927, with six deaths. Deaths have not been noted or reported in the statistics that I have had from other communities.

SURGICAL DIAGNOSIS OF THE UPPER RIGHT QUADRANT*

H. A. Walker, M.D.,
Hollywood.

The history in diagnosis of surgical affections of this region is of utmost importance. Heyd and Erdman of New York call attention to the facts that the primitive gastrointestinal tract is a simple tube occupying a midline position. Embryologically, it is divided into three portions—the foregut, the midgut and the hindgut. Anatomically, the stomach, duodenum, liver, biliary duct system and pancreas are derivatives of the foregut, and in this alimentary segment every digestive enzyme is secreted and the mechanical process of digestion carried out.

Our physiological conception of the stomach has undergone a rather extensive revision since the days of Beaumont. We may conceive, however, of the stomach as exercising primarily two important functions, that of secretion and that

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of motion. Contrary to the usually accepted idea of gastric physiology, the terminal portion of the stomach is alkaline, and in the fasting or resting phase of the stomach there is a reflux of duedenal materia; into the antral portion of the stomach, the acidulation and acid digestion of stomach contents taking place in the proximal two-thirds.

In interpreting the symptoms that arise from disturbances of the gastrointestinal tract we should have firmly in our minds two fundamental conceptions, one called by Bayliss the "law of the intestine," which states that stimulation of any part of the intestine leads to contraction above and relaxation below. This is a general law and is applicable to the entire alimentary canal. Essentially it means that under normal conditions contraction in one place is associated with relaxation just below. Metzler called this the law of contrary innervation. The second fundamental conception is what is called the "law of average localization," which explains why visceral pain is most accurately located in viscera which do not move, such as gall bladder, esophagus, duodenum, ascending and descending colon, and rectum, and less accurately in the more freely movable organs, such as the small intestines and stomach. The brain learns to localize sensations in the area of the average position of the part from which they originate. The importance of these two laws in the interpretation of the symptomatology of abdominal conditions is very great, and we must recognize that disturbance of one part of the alimentary tract may manifest itself by symptoms in some distant portion.

Probably the most frequent symptom numerically in abdominal conditions is that of dyspepsia. The stomach, by reason of its muscular apparatus and rather close proximity to the outside world by way of the esophagus, may be spoken of as the voice of the upper abdomen, and malfunction of the upper intestinal tract induces quite early the symptoms of indigestion. Again dyspepsia is one of the most common reflex disturbances of general constitutional disease.

The appendix, while not located in the upper right quadrant, nevertheless, has to be considered from a differential diagnosis standpoint. Its symptomatology is precise and, within the first 24 hours of its evolution, embraces the following chronological order of symptoms: (1) pain; this is epigastric, confined to the region of the umbilicus, and is colicky in type; (2) is followed by nausea or vomiting or both; (3) generalized abdominal sensibility; (4) temperature; (5) leucocytosis and ascending polynucleosis. One can explain this chronological evolution of symptoms by consideration of the pathological sequence of events in the affected appendix. The infection arises on the mucosa in 95% of cases; it is associated with tumefaction and imtumescence and we have as angulation of the appendix with occlusion of the lumen or occlusion of the lumen at the valve of Gerlach. At this stage we have essentially an empyema, and the products of the infection are retained within the lumen of the appendix under pressure. One of three things occurs: (1) gangrene of the appendix; (2) rupture, or (3) resolution by intracecal drainage of the contents of the appendix. These pathological states distinctly parallel the symptomatology.

At the time the infection begins in the appendix we have a point of irritation below the small intestine and we have a disturbance of the law of the intestine with the small intestine participating in an exaggeration of its normal peristaltic activity. As a result we have colicky epigastric pain from hyperactivity of the small intestine. The exaggeration of the function of the small intestine brings about generalized abdominal sensibility, and the activating agent in this trend of events is an infective process which produces the constitutional reaction of temperature, leucocytosis, and polynucleosis.

Turning to chronic appendicitis one is confronted with an entirely different evolution of symptoms. Here we have an infection that disturbs the rythmic workings of the law of the intestine in that contraction is followed by relaxation. The most typical example of this neuromuscular mechanism is found at the cardiac, pyloric, ileocecal, and anal sphincters which normally relax as peristaltic waves come to them. The presence of a minor degree of irritation in the appendix brings about a disturbance of the neuromuscular apparatus of the ileocecal valve and pylorus. Barclay has shown that spasmodic closure of the pylorus follows stimulation of the terminal ileum. At the ileocecal valve we have a great biological partition. Here the chemical reaction of the intestinal contents changes, the bacterial flora reaches its maximum development, the fluidity of the contents is at its greatest, there is an anistalsis rather than peristalsis, and this is the place of predominant lymphoid tissue development within the abdomen, together with a

natural point of stasis or delay. The history, then, of chronic appendicitis is characterized by variability and lack of that precision which characterizes acute appendicitis. There stands out, however, in the history of these patients almost invariably the history of an acute attack, and one is surprised to find on checking up "after results" that the cases that complained of pain in the right lower quadrant have uniformly not been cured by the removal of the appendix, but that the cases that complained of atypical dyspepsia due to a supposedly diseased appendix have been almost uniformly cured of their distress by an appendectomy.

In disease of the biliary system we are confronted with a pathological and symptomatic sequence of events that is rather characteristic and definite. The basis from the production of symptoms is essentially due to infection in the gall bladder whether stones are present or absent. One recalls the rather high percentage of hepatitis that coexists with chronic cholecystitis, and the relationship of pancreatitis to disease of the biliary system is so thoroughly elaborated as to require little comment. The end result of cholecystectomy conclusively demonstrates that the patients are apparently in as excellent condition of health after cholecystectomy as before, and that, so far as the general metabolic processes of the body are concerned, the presence or absence of the gall bladder is not of much importance.

If one made a study of sufficiently large number of cases of biliary disease he would find that he could catalogue the patients into four distinct clinical groups: (1) those that complain of indigestion only; (2) those that give a history of acute attacks of biliary colic, with or without preceding indigestion; (3) those that give a history of biliary colic and also the history of jaundice; (4) those who give any of the above histories and develop the complications of biliary disease—carcinoma, pancreatitis, duodenobiliary fistula, etc.

The early symptoms of cholecystitis, whether calculous or non-calculous, are the symptoms of an indigestion of which the chief complaint is gas in the stomach. For a variable period of time these patients complain of a sense of weight and fullness in the stomach, present after small meals and relatively worse after large meals. Upon belching gas there is obtained some relief, and a not uncommon history is that of the patient leaving the dinner table and inducing vomiting with complete ameloriation of symptoms. The gas production is in a measure dependent upon the quality of the food—carbohydrates, fats, starches, nuts, and some fruits induce a greater degree of gas production. These patients are treated for nervous indigestion or gastritis when they have a chronically diseased gall bladder with thickened walls and a loss of the normal distensibility of the gall bladder. Into this history there may ensue at a later period or without this history of indigestion the first indication of biliary trouble, ushered in by an attack of acute, sharp, agonizing pain which comes on like a stroke of lightning, is of maximum intensity and is associated with restlessness and movement upon the part of the patient. There is a strong desire to lean over a chair or grip the lower portion of the thorax. With this is usually associated nausea and vomiting. The attacks of pain have a predilection for nocturnal occurrences and are so severe as to require hypodermics or morphine for their control. The characteristic and outstanding feature is the lightning-like onset of the pain, without premonition or warning, and its intensity requiring morphine. After four to eight hours the pain disappears almost as rapidly as its onset, leaving behind a residual soreness along the right costal margin. The third clinical group is characterized by a history somewhat after the fashion of the preceding types, with the exception that after an attack like the above they find themselves jaundiced, and in this group we have a trinity of symptoms—colic, jaundice, and sepsis cholangitis. This jaundice is associated with colic and usually with chills, fever and sweating and for many years masqueraded under the title of Charcot's intermittent hepatic fever and was variously ascribed to malaria.

Jaundice is a symptom of sufficient magnitude to make the patient apprehensive. If one considers the diagnostic possibilities he will find that aside from catarrhal jaundice—a condition founded upon insecure pathological information—which is characterized by slight constitutional disturbance and uniformly resolves and clears up in four to six weeks, we have essentially a differentiation of jaundice produced by neoplasms and the jaundice produced by calculous disease of the biliary apparatus. Stupor is only associated with jaundice in cirrhosis and acute yellow atrophy, while emaciation is uniformly

present in all types of chronic jaundice, irrespective of the etiological factor. The onset of jaundice with colic predicates an infective process, and since 98 per cent of all gallstones have had their origin in infective changes in the gall bladder, we find that the gall bladder in chronic calculous cholangitis is atrophied, thickened or undergoing fibroid contracture and is non-palpable on physical examination unless there is an accidental occlusion of the cystic duct with hydrops of the gall bladder.

Ulcer of the gastroduodenal segment is located anatomically in three main places: (1) in the silent area of the stomach with no pyloric involvement; (2) on the pyloric segment with obstruction from spasm of invasion; (3) in the duodenal segment. Eighty-eight per cent of all ulcers are characterized by a regular and uniform symptomatology and three symptoms stand out in unusual prominence: (1) pain that bears some relationship to the time of ingestion of food; (2) chronicity—the symptoms extending over a considerable period of time, and (3) periodicity—in that the symptoms recur in exact similarity day after day with almost unvarying precision. Eighty-five per cent of all ulcers of the stomach are situated on the pylorus, antrum or the adjacent three-fourths of the lesser curvature and it is the regularity in the symptomatology of ulcer that make the diagnosis possible. A loss of the periodic element with symptoms which suggest ulcer makes one suspicious of malignancy, for 99 per cent of the malignant growths of the stomach show an absence of periodicity in their symptomatology. Depending upon the localization of the ulcer we have certain specific features that go with each one. The ulcer in the silent region of the stomach is, as a rule, characterized, in addition to the above mentioned symptoms, by the early habit of vomiting, the vomiting of undigested food with a tendency to be blood-streaked. The pyloric ulcer has early induced in its symptomatology a motor insufficiency with stagnation of gastric contents and vomiting of large quantities of retained gastric content and food remnants of a previous day's ingestion. The duodenal ulcer has characteristically added to these three major symptoms nocturnal occurrence, usually after 12 p. m., and the complete alleviation of symptoms upon ingestion of food, while all three types of ulcer acquire, early and independent of the physician's advice, the bicarbonate of soda habit.

The ulcer near the cardia frequently, but not invariably, produces pain almost immediately after the ingestion of food; the ulcer at or near the pylorus from an hour and a half to two hours, while the pain in duodenal ulcer is much more constant in the time of onset, being between two and a half hours to three hours after a meal.

There are no symptoms which are pathognomonic of cancer, and at the time that one most desires to make a diagnosis of cancer there is no outstanding clinical picture that renders this possible. The presence of carcinoma of the stomach is made known only when ulceration occurs or when there is an interference with the evacuation of the stomach contents. In general, carcinoma of the stomach manifests itself early by mechanical factors rather than by changes in chemistry. Cachexia is one of the most prominent symptoms, being present in approximately 85 per cent of cases that are diagnosed as carcinoma. A palpable tumor exists in about 58 per cent, food remnants in 65 per cent and pain is present in over 85 per cent of cases. We find cancer of the stomach clinically portrayed by three quite distinct types of history: (1) the first group, constituting about 60 per cent, occurs in patients who have had a history of gastric distress covering at least a period of eight to ten years. This previous gastric history entitles us to believe that the patient was suffering from chronic gastric ulcer. There were repeated attacks of pain occurring day after day, with a time relationship to the ingestion of food and with a periodic reproduction of the same symptoms day after day. Into this history there comes one attack from which the patient does not recover or does not respond to a form of medicine treatment that has heretofore proved beneficial. The pain becomes constant, marked distaste or aversion to food is acquired, blood is constantly present in the stool and the patient has a duration of cancer symptoms of six months. The second group constitute 30 per cent and occurs in the type of man who has previously been perfectly well. He has an attack of gastric distress which suggests an acute ulcer of the stomach, with or without hemorrhage. At the end of a few months the man has lost physically beyond anything that could be expected in a simple ulcer, and all too soon a progressive anemia and emaciation and beginning cachexia make known the diagnosis of rapidly growing carcinoma; his cancer symptoms average about eight to ten

months. The third group is represented by approximately 10 per cent, with a history that is suggestive of simple ulcer from which he nearly recovers, but never quite wholly, and after a variable period of time—14 to 18 months—slowly but progressively becomes worse, acquires a marked aversion to food, and progresses into the well-defined cachexia of malignancy.

In differentiating gastric and duodenal ulcer, we may say that duodenal histories have a longer course in years (11 per cent) than do gastric, perhaps in part because there is less chance of latency when they are situated in the duodenal area. The longer the history the more likely is the ulcer to be duodenal. The higher the acid, the lower the ulcer. Hemorrhage is more often present in gastric ulcer. More duodenal ulcers than gastric ulcers are diagnosed as gall bladder trouble. Position (reclining) and pressure ease are more indicative of gastric than duodenal ulcer. Night pain is more frequent in duodenal ulcer. Ease before the next meal occurs more often in gastric ulcer. The higher ulcers seem to run shorter attacks, are repeated more often or with only remissions. The size of the ulcer seems to have quite as much or more influence on symptoms than has the position. Small ulcers with high location often give clear-cut duodenal ulcer history. Large ulcers, wherever situated, give shorter food ease; they tend to constant symptoms; more remissions than intermissions; food is more apt to give immediate distress, and the patient is easier with the stomach empty. These ulcers lose type.

The roentgen ray does locate the disease whenever its findings are positive; therefore, its influence is striking and it has the exactness that the clinical histories lack. But the X-ray has its difficulties, and we need all our combined forces to make a respectable showing. We see no great benefit to the patient in such exact localization so long as the peptic lesion is diagnosed and the patient gets proper medical or surgical attention. However, it is a comforting sort of feeling when later the X-ray or surgery proves the accuracy of one's observations.

Vomiting or passing blood may be a factor in diagnosis, but a diagnosis of ulcer should be made without the evidence of hemorrhage, as a diagnosis of gall-stones should be made before jaundice, save in those cases in which hemorrhage is the first or only symptom of ulcer, and jaundice the first or only symptom of gall-stones. In this stage the symptoms, their time of appearance and control, are still usually clearly defined and a diagnosis may be easily reached.

Still later, when complications have arisen, perforation, adhesions, large ulcers, contractures, obstructions and the like, the symptoms may take on varied hues and we are at a loss, unless we have been careful to get our early definite history. The symptoms now may be greatly prolonged, never quite clearing up, or they may be continuous, with gradually increasing invalidism. Pain increased or not eased by food, food soon adding distress, sour, bitter, burning eructions and vomiting of large quantities, loss of weight, decided obstruction and cachexia may be present. Vomiting, irrigation and alkalies usually bring some degree of ease. The history is that of stomach and we can usually by exclusion reach a respectable diagnosis. The early history is here a great illuminating factor and the roentgen ray is a comfort, as it is, indeed, in all stages of peptic ulcer.

There is a class of ulcer cases not so large but quite distinctive and extremely difficult to diagnose. Clinically they are diagnosed gall-stones. These ulcers are often duodenal or pyloric but may be gastric. They seem to have no complications save frequent perforating tendencies, yet a part are not so reported at operation. Often the only symptom complained of is sudden, acute, short attacks of epigastric pain, rarely with radiation, but which may radiate to the back if posterior perforation is impending. Recovery from pain is usually sudden and complete, typically gall-stones in character and no other rational diagnosis can be made save by the aid of the X-ray. In the group of cases under discussion, the roentgen ray and the surgeon must disclose the condition, or, when no operation is done, characteristic symptoms develop later. In the larger group of chronic complicated ulcer cases with perforation, the early history gives the solution.

In conclusion, we may say: (1) that surgery of the upper right quadrant is as marked major surgery as we encounter in any region of the body; (2) that the history and differential diagnosis of the affected parts of this region is quite important, and, that on the whole not so easily differentiated, but on the other hand with the thorough study of symptoms and clinical pictures along with the aid of the roentgenologist, the diagnosis may be made to a certain degree of satisfaction.

SPINDLE CELL SARCOMA OF THE KIDNEY—CASE REPORT*

Roy J. Holmes, M. D.,
Miami.

History: M. A., male, aged 44, Italian, was admitted to the Urological Division of Jackson Memorial Hospital July 12, 1927, complaining of fever, malaise, chilly sensations, and a deep, dull ache in the left lumbar region. Occasionally this pain became more intense and presented all the characteristics of severe renal colic. Symptoms first became evident five months ago. He was referred to a competent urologist two months later and on finding a small shadow in the middle calyx together with a large amount of pus in the left kidney specimen, was given pelvic lavages and dilatations directed toward the relief of what was thought to be calcareous pyonephrosis. He continued to lose weight, was unimproved, and occasionally passed small quantities of macroscopic blood. He did not, at any time, pass blood in sufficient quantities to suggest hemorrhage. On account of the patient's inability to speak English, it was very difficult to obtain an accurate history. He came under our observation August 1st, 1927.

Examination: For the sake of brevity, we will omit the complete physical examination as unimportant. When first seen by us, he appeared markedly undernourished, cachectic, and had apparently lost much weight. On attempting to palpate the left kidney, we immediately encountered a large, firm, but freely movable mass, which suggested a large pyonephrotic kidney. Patient complained of moderate pain on deep palpation and stated that the mass became smaller at times. Blood pressure, 140 systolic; 95 diastolic. Wasserman, negative. No other blood work was done.

Course: Patient at this time was running a septic temperature as high as 103 and often preceded by a chill. He was cystoscoped August 3d, and, while a large amount of pus and blood were evacuated from the left kidney, the right specimen was normal. The left kidney only eliminated 5 per cent pthalein during the first half hour. The right kidney function was slightly above normal. Pyelograms and plain films made of the left kidney showed the upper border of the kidney distinctly outlined. The calyces were markedly distorted and seemingly displaced upward toward the upper pole. The lower and middle calyces could not be identified except as very vague shadows without contour. Beginning about two inches below the upper pole of the kidney, the shadow of the kidney outline gradually faded away. The lower pole could not be outlined. As these findings were verified by repeated pyelograms, the diagnosis of tumor of the left kidney was made and the patient nephrectomized August 14th. The kidney was about three times the normal in size and was easily delivered. Adhesions were very few, and seemingly there was no metastasis by direct invasion of surrounding tissue. At the lower pole, the normal parenchyma was entirely displaced by a nodular mass of grey or greyish white color. The outer surface of the kidney was especially nodular. At the center of the kidney, a large hemorrhagic area, evidently due to cyst formation or myxomatous degeneration, was seen. A very small portion of kidney tissue remained at the upper pole. Examination of the specimen by Dr. Stowe proved the pathology to be that of spindle cell sarcoma of the kidney.

Remarks: Spindle cell sarcomas are grouped with a variety of renal growths of connective and mixed tissue derivation under the heading of embryonal tumors. As to the etiology, by far the most thorough and comprehensive work has been done by Birsch-Hirschfield. This observer called attention to the close relation of the Wolffian body to primitive kidney tissue, and conceived the idea that in the embryo Wolffian body inclusions, becoming incorporated in the developing kidney, might be the origin of rhabdomyomas and adenosacromas. Willms developed the hypothesis further, suggesting that the striated muscle had its origin in bits of myotome which became displaced and included in the kidney, bone and cartilage having a similar origin from the vertebral anlage. Malignant tumors of the kidney of any type are relatively rare. Kelynack found only six primary cancers of the kidney out of 1,400 patients suffering with cancers elsewhere. Muller, in 521 cases of cancer, found only three of the kidneys. Hypernephromas are by far the most common malignant tumor met with in kidney work, being twice as common as all the tumors of the embryonal group combined. In Cabot's series of 31 tumors of the embryonal group, only three were spindle cell sarcoma being greatly outnumbered by the mixed tumors. Unlike hypernephroma, the sarcomas are much more likely to metastasize by direct invasion than by involvement of the veins. Walker found that 50 per cent of the sarcomas coming to operation had not metastasized.

*Read before the Dade County Medical Society, Miami, September 2, 1927.

SPINAL ANESTHESIA*

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St. Augustine.

Spinal anesthesia is the loss of sensation obtained by puncture of the spinal dura mater and arachnoid with the injection of an anesthetic solution into the subarachnoid space. This solution acts upon the nerve roots and has very little or no action upon the spinal cord.

HISTORY

It was Dr. J. Leonard Corning[1] who, in 1886, first produced spinal anesthesia. He injected two per cent cocaine solution into the lower dorsal region of a dog. This caused paralysis of motion which was soon followed by complete recovery. His next experiment was upon a man suffering from a sexual disturbance. Thirty minims of a three per cent cocaine solution were injected between the eleventh and twelfth dorsal vertebra. No anesthesia resulted, so another injection of the same drug was given. This produced incoordination of the lower extremities and anesthesia to such a degree that urethral sounds were passed without causing pain. It was not Doctor Corning's intention to inject the cocaine solution directly into the canal. He believed that if it were injected near the veins in the vicinity of the spine, the drug would be carried to the cord and anesthesia produced. However, the result which he obtained suggests that the dura was punctured and that the injection was not paravertebral, but intrameningeal.

Aided by the discovery, in 1891, of lumbar puncture by Quinche, Augustus Bier,[2] of Bonn, Germany, also investigated this form of anesthesia. In 1898, he allowed the method to be tried upon himself to more accurately observe its effect. Bier used a solution of cocaine. He developed the technique of its injection into the subarachnoid space to such a degree that others were convinced of its value as an aid in surgical procedures upon the lower extremity. However, Bier temporarily abandoned this form of anesthesia as he feared the toxic action of cocaine.

Tuffier,[3] of France, with admirable courage and despite considerable opposition continued and popularized this method of anesthesia, extending its application to operations upon the pelvic and abdominal organs.

As statistics accumulated it was found that the mortality rate from spinal anesthesia was much greater than that from anesthesia induced by ether. This caused most surgeons to abandon the use of the method. Fortunately, with the advent of tropococaine, stovaine and novocaine, interest in this form of anesthesia was revived and the method perfected to such a degree of safety that much of the opposition to its use has vanished.

ANATOMY

The spinal cord terminates at the lower border of the first lumbar vertebra, in a cone-shaped end, the conus medularis. In women and children it ends at a lower level and occasionally may extend to the third lumbar vertebra. The filum terminale is a process of pia which extends from the conus medularis to be attached to the base of the coccyx. On the lateral aspect of the spinal cord, the roots of the spinal nerves are to be seen as they leave and enter the nervous tissue. The anterior roots are motor and the posterior are sensory in function. Below the conus medullaris the roots of the lumbar and sacral nerves, passing downward to their foramina of exit from the vertebral canal, form a bundle which is known as the cauda equina. In the mid-lumbar region the cauda equina lies in two bundles, one on each side of the mid-line. The cauda equina is surrounded by the dura and arachnoid.

The gangliated cords of the sympathetic nervous system are situated on either side of the vertebral column and are connected to the spinal nerves by the rami communicantes. There are usually two rami communicantes to each ganglion. One of these branches is white, composed of medullated nerve fibres, which come from the spinal nerves and go to the sympathetic nerves. The other branch is gray, composed of non-medullated nerve fibres, which come from the sympathetic ganglion and go to the spinal nerves to be distributed principally to the blood vessels and glands in the course of these nerves.

ACTION OF SPINAL ANESTHESIA

When an anesthetic drug is introduced into the subarachnoid space it interrupts[2] conduction in the motor nerve roots, the sensory nerve roots, and in the rami communicantes, in those segments with which it comes in contact. The patient soon after the injection of the drug feels a tingling in the legs followed by heaviness and numbness. Usually, in from three to five minutes, there is complete anesthesia with paralysis quickly extending from below upwards. How-

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ever, it does not reach its greatest height for ten minutes after the injection. As the anterior nerve roots are less exposed to the drug than the posterior nerve, it occasionally happens that a patient may have complete analgesia and retain motor power. Often the tactile sense is retained after there is a complete loss of pain sense.

Circulation.—Spinal anesthesia has its most notable effects upon the circulation and a fall in blood pressure varying from twenty to more than one hundred millimeters of mercury accompanies each spinal injection. This is easily understood by recalling that the vasomotor centers for the head, neck, upper extremity and thorax are situated in the upper thoracic cord, those for the lower part of the body are located in the lower thoracic and upper lumbar region of the cord. Therefore, with paralysis of the vasomotor nerves and the relaxation of the voluntary muscles, an increased quantity of blood accumulates in the large splanchnic veins.

The heart works more slowly. This is due to lowered blood pressure lessening the intracardiac pressure, thus the stimulus to cardiac action is lost. The inhibitory nerves of the heart (vagi) are unopposed due to the fact that many of the sympathetic nerves which normally stimulate the heart have been blocked off by the anesthetic drug. If the upper dorsal segments are involved, the pulse rate may drop to thirty and the blood pressure at the wrist almost to zero.

Respiration.—If the anesthetic effect of the drug is confined below the diaphragm, very little change is noted in the respiratory rate or volume. However, if the lower dorsal segments of the cord are involved, the muscles of the thoracic wall become paralyzed, the respiration slow and shallow and largely diaphragmatic in character. Another effect of lower dorsal segment involvement is a tremendous fall in blood pressure resulting from vasomotor paralysis. This causes anemia of the brain with diminished function of the respiratory centers and which may be carried to such a degree that their function is arrested.

Relaxation.—Complete muscular relaxation is the rule with spinal anesthesia.

Abdomen.—The abdominal walls are completely relaxed and flaccid, thereby enabling the surgeon to operate with less difficulty and much less traumatism to the tissues than when a general anesthetic is used.

The sympathetic nerve supply, which normally inhibits intestinal movements is paralyzed, leaving the vagus and the nerve plexuses in the intestinal wall unopposed in their stimulating functions. As a result, the stomach and intestines are contracted and peristaltic movements are much increased. The external sphincter ani is relaxed due to paralysis of its spinal nerve supply.

Kidneys.—Spinal anesthesia has no irritative or other effect on the kidneys. Examination of the urine before and after injection shows no change. When the ureters are catheterized[2] the kidneys are found to be secreting as well as if the patient were not anesthetized.

Liver.—It has no effect on this organ.

Skin.—The skin remains dry and warm.

Reflexes are abolished.

Nausea and Vomiting are not uncommon, occurring in about seven per cent of patients. It most frequently happens while the patient is on the operating table and is transient. As a secondary symptom it is very rare.

Cord.—Spinal anesthesia is a nerve root anesthesia and has little or not effect on the spinal cord.

MECHANICAL CONDITIONS

In discussing the action of spinal anesthesia the mechanical conditions of the solution and of the spinal canal must be considered. They greatly influence the action of the drug and the anesthesia produced. If the solution is of the same density as the spinal fluid it mostly remains at the point of introduction; if lighter, it ascends in the canal and descends if heavier.

Dr. A. E. Barker advocated solutions of a higher specific gravity than the cerebrospinal fluid. To accomplish this he added glucose. When injected below the third or fourth lumbar vertebra the solution descends whether the patient be sitting or lying on the back, owing to the natural anterior curvature of the spine in this region. If introduced between the third or fourth lumbar vertebra or higher, it will ascend, when the body is lowered, to the point of greatest convexity of the dorsal spine, which is about the fifth or sixth dorsal vertebra. The solution remains for the most part wherever gravity determines.

Dr. W. Wayne Babcock[3] reverses the procedure of Barker and advocates solutions of a lighter specific gravity than the cerebrospinal fluid. He uses absolute alcohol to accomplish this.

Hemi-anesthesia may be obtained by keeping the patient on one side.

Diffusion of the anesthetic solution in the cerebrospinal fluid is a slow process, and may be hastened by changing the position of the patient, this action causing oscillation in the cerebrospinal fluid.

ANESTHETIC SOLUTIONS

Cocaine Hydrochloride is an alkaloid derived from coca erythroxylon. It was used by Corning and Bier only to be abandoned because of its toxicity. However, in a more purified form, it is again being used by many continental and some American surgeons. The subarachnoid dose is 0.01-0.05 gms. Since the early days of spinal anesthesia, various synthetic agents have been introduced as substitutes for cocaine and to these discoveries belong the credit for the renewed interest in this form of anesthesia. Those which have had an extensive use are stovaine, procaine, apothesine, alypin, butyn.

Stovaine.—This synthetic substance was introduced by Fourneau in 1904. It appears in small brilliant scales and its solutions are not decomposed by boiling. It is freely soluble in water and is slightly acid in reaction. When absorbed into the general system its toxicity is said to be one-half that of cocaine. Stovaine acts with like intensity on the anterior and posterior nerve roots and upon their vasomotor fibres. The fall in blood pressure is of shorter duration than that produced by butyn.[4] The maximum dose is .07 grams.

Procaine or novocaine is a colorless, crystalline substance, soluble in its own weight of water, neutral in reaction, and is not damaged by boiling. Experiments on animals indicate that it is one-seventh as toxic as cocaine and is lowest in point of toxicity of any of the drugs in this class. However, double the dose of stovaine is needed to produce anesthesia, which in practice greatly lessens the difference in toxicity. In spinal anesthesia procaine acts with more effectiveness on the posterior than the anterior roots of the spinal cord. It will cause perfect anesthesia, but does not produce a muscular relaxation equal to that produced by stovaine. The average dose is .1 to .12 grams.

Apothesine appears in snow-white crystals and is readily soluble in water. The Council on Pharmacy and Chemistry of the American Medical Association states in its recent report that the toxicity of apothesine is to the toxicity of cocaine as twenty is to fifteen and that it has about twice the toxicity of procaine. It has much the same action as procaine except that the anesthesia produced is more rapid and prolonged. None of its anesthetic properties are destroyed by boiling. Apothesine is placed on the market in small hypodermic tablets, also in ampules containing the drug itself or its solutions. The average dose for an adult is 0.1 to 0.12 gms.

Tropococaine is a vegetable alkaloid and is derived from coca erythroxylon. It is only one-half as toxic as its sister alkaloid cocaine. It is now being less frequently used for the induction of spinal anesthesia as the results obtained have been unsatisfactory.

Butyn is a synthetic product, more toxic than stovaine and procaine. When injected intradurally, it depresses the vasomotor fibres of the spinal nerves to a greater degree than stovaine or procaine, thereby giving a prolonged fall in blood pressure. Because of the hypotension caused and its toxicity, this drug is seldom used in producing spinal anesthesia. To induce anesthesia 0.03 gms. is required.

The use of so many different drugs for the induction of spinal anesthesia suggests that the ideal drug for this purpose has not as yet been found.

PREPARATION OF PATIENT

There is no need for such stringent preparation of the alimentary tract as is demanded for the administration of a general anesthetic.

Morphine sulphate grains 1/6 and scopolamine hydrobromide grains 1/100 are administered hypodermically before operation. This greatly benefits the psychic condition of many patients and they come to the operating room indifferent and oblivious to their surroundings. The effect of the scopolamine and morphine may be increased if the patient's ears are plugged with cotton wool and the eyes covered with a bandage, so as to more or less completely shut out the stimuli of sound and light.

TECHNIQUE

Position.—The patient sits across the operating table and should lean a little forward with the back well arched. This position is more convenient for the anesthetist, but is not so favorable for all kinds of patients. Occasionally, patients are unable to sit up; this makes it necessary for them to assume the lateral recumbent position, with the back well arched. After the injection the patient should be turned immediately on his or her back to insure an even distribution of the anesthetic to both sides of the cord.

Landmarks.—A sterile towel is held between the crests of the hip bones, the edge of the towel crosses the spinous process of the fourth lumbar vertebra. After this is located it is usually very easy to palpate the spinous processes of the other vertebra. Or a perpendicular line[6] measuring five centimeters, dropped from the twelfth rib on the midline of the back, marks the spinous process of the twelfth dorsal vertebra.

The instruments necessary for the induction of spinal anesthesia are few in number and vary with the technique developed by different operators. The author in his work has followed the technique as developed by Doctor Babcock,[5] a two mil. all glass, Luer syringe and a needle of nickeloid or platinum, gauge 20, nine centimeters long, with a sharp but obtuse concave point and a well-fitting stylet are the instruments required. The solution injected is put up in ampules each containing stovaine .08 grams, lactic acid .02 mil, ethyl alcohol pure .2 mils., distilled water to make 2.0 mils. The ampule made of non-soluble glass is sealed and pasteurized on three successive days at a temperature of 65° C. for thirty minutes. The syringe and needle are boiled in distilled water in a separate basin and brought to the operator while boiling hot. The ampule containing the anesthetic solution which has been sterilized by immersion in alcohol, is dried and opened by an assistant. The operator draws this into the hot syringe, thereby warming it to about body temperature. The needle is then inserted through the midline at the middle of the interspace and perpendicularly to the skin. As soon as the resistance of the interspinous ligament is felt, the stylet is withdrawn and the needle carried cautiously forward until the snap is felt as the dura is punctured and a few drops of cerebrospinal fluid allowed to escape. The injection should not be given unless clear cerebrospinal fluid runs freely from the needle. The syringe is attached and the injection made rather slowly, without undue force, first injecting about one-half the contents of the syringe, then more new fluid aspirated and the syringe again discharged in the same way, leaving less fluid in it each time so at the end of four or five injections it is emptied.

The solution is of a lighter specific gravity than the cerebrospinal fluid. After making the injection the patient is quickly laid upon the operating table and the head and shoulders lowered so that they are at least two inches below the hips.

The interspace selected depends on the site of the operative field. For upper abdominal work the twelfth dorsal interspace is used. For lower abdominal work the first lumbar interspace is used. For operations upon the legs the second lumbar interspace is used. For operations upon the rectum and perineum the third or fourth lumbar interspace is used.

The dose for an adult is 1.0 to 1.5 mils. of the stovaine solution.

Procaine or novocaine is used by many operators. The method of injection varies with different surgeons. The average dose is 120 mg. of sterile novocaine crystals dissolved in 2 to 3 cubic centimeters of spinal fluid. After withdrawal of the needle the patient sits upright for five minutes and is then slowly laid down. Gellhorn states that the upright position is maintained for that length of time to allow the greater portion of the novocaine to be absorbed and held fast by the nerves of the cauda equina. What is left of the novocaine diffuses into the spinal fluid and when it finally reaches the medulla it is too dilute to effect the respiratory center. Labat and others have the patient lie down immediately with a pillow under his head.

Rytma and Tolson[8] use apothesine. After trying various solutions of the drug they now use apothesine in powder form. The ampules contain 0.12 grams and this is dissolved in two or three mils. of spinal fluid. They allow ten to twenty-five mils. of cerebrospinal fluid to escape before making the injection of the anesthetic drug.

Jonnesco[2] advocates the use of injections over the spinal cord proper. He uses stovaine to which strychnine sulphate has been added, claiming that the strychnine combats the depressing respiratory effect often seen from high injections of stovaine. His points of injection are the medio-cervical, upper dorsal, dorsal lumbar and lumbar. He varies the dose according to the height of anesthesia desired and the condition of the patient. According to Jonnesco, failure to observe these conditions is responsible for such fatalities as have occurred in the practice of other surgeons using his method.

Le Filliatre's[6] special technique, called "barbotage," demonstrates the possibility of obtaining anesthesia of the entire body by subarachnoid injection of cocaine through the lumbosacral

space. A large spinal puncture needle is required for this work.

Delmas[9] modified Le Filliatre's technique and it is as follows: the dura is punctured at the fourth lumbar interspace, twenty-five mils. of cerebrospinal fluid are withdrawn and twenty mils. of this discarded. An ampule containing from 0.01 to 0.05 grams of dry cocaine crystals is opened, and from three to five mils. of cerebrospinal fluid mixed with the cocaine. This is drawn into the syringe which is then adjusted to the needle and twenty mils. of new spinal fluid drawn into it. The contents of the syringe is now thrown forcibly into the subarachnoid space, the height of the anesthesia depending on the force used. The time required for the operation guides the surgeon as to the quantity of cocaine to use; 0.01 gram giving an anesthesia lasting fifteen minutes, 0.04 grams for one to one and a half hours. Doctor Delmas reports four hundred and thirty-one patients operated upon while under this form of anesthesia with "no failures, no mortality."

POSTOPERATIVE CARE

The subsequent nursing of patients having had spinal anesthesia is much simplified and an uneventful recovery from the anesthetic is usual. Vomiting may occur but is rare. The great muscular restlessness seen in patients recovering from ether anesthesia is absent, thereby preventing any undue strain upon the wound. Abdominal distension is noticeably absent. Patients may take nourishment soon after leaving the operating table. As the effect of the anesthetic wears off, morphine may be given to relieve pain. Control of the relaxed anal sphincter returns with the disappearance of the anesthetic.

OPERATIVE AND POSTOPERATIVE COMPLICATIONS

The after effects from spinal anesthesia usually occur at periods closely related to the time of injection and are chiefly dependent upon the fall in blood pressure. In some patients the blood vessels seem incapable of accommodating themselves to the sudden change and this is indicated by pallor of the face, cold sweats, weak pulse and very shallow and slow respiration. Respiratory failure is due to anemia of the brain brought on by the fall in blood pressure. At the Samaritan Hospital[16] alcohol, atropine, strychnine, caffeine and pituitrin have been extensively used to combat this condition, but these drugs have little or no effect on raising blood pressure. In cardiac conditions, digitalis may be of some value when administered several days before operation, thereby enabling the weakened heart to better withstand such a sudden fall. When needed at operation, a small amount of ether may be given by inhalation as it increases the blood pressure from two to twelve millimeters of mercury. Very light gas oxygen anesthesia has the same effect. Inhalation of aromatic spirit of ammonia will raise the blood pressure from six to twelve milligrams. However, adrenalin chloride given intravenously is the best antidote. The average amount used is from two to fifteen minims of a 1-1000 solution. This should be administered slowly and in dilute solution. In respiratory failure institute artificial respiration and if the heart stops beating, immediate cardiac massage and normal saline solution containing adrenalin chloride, should be given intravenously.

Ephedrine, that drug known to Chinese medcine for more than 5,000 years, gives promise of overcoming the fall in blood pressure. Its action is similar to epinephrine but is more prolonged. Given .1 gm. subcutaneously it restores the arterial tension by the spinal injection.[11]

Nausea and Vomiting occasionally occur on the operating table. The condition is improved by insisting that the patient breathe through his or her mouth. It very rarely happens as a postoperative symptom and when it does, is very transient in character. In a few cases it may persist for twenty-four hours and is best treated by gastric lavage.

Headache.—Postanesthetic headaches, frequent in the early days of spinal anesthesia, are now rare, but in some patients they do occur a few hours after the injection. Treatment consists of putting an ice cap on the patient's head and quietness, with the administration of a few doses of aspirin. If persistent, a spinal puncture should be performed with the patient in the lateral recumbent position and from fifteen to twenty-five mils. of spinal fluid withdrawn.

Ocular Palsies.—With the introduction of aseptic alcoholized solutions of the anesthetic drug twelve years ago, abducens palsy has not occurred as a postoperative symptom in the spinal anesthesia work at the Samaritan Hospital.[5] However, some clinics report its occurrence.[2] It lasts but a few hours and needs no treatment. The pathogenesis of these palsies has not been satisfactorily explained.

Paraplegia.—Postanesthetic paraplegia is

probably due to the development of conditions already existing at the time of anesthesia. It is possible that a careful study of the patient would have revealed syphilis as the causative factor rather than the anesthetic.

Infection of the spinal fluid. Aseptic technique eliminates this condition as a complication.

Poisoning is possible in patients with hypersusceptibility to the anesthetic drug used. However, the large amount of novocaine used in infiltration anesthesia, with almost no mention in the literature of poisoning, indicates that the normal individual runs very little risk from the small amount of drug used in an intradural injection.

ADVANTAGES OF SPINAL ANESTHESIA

Spinal anesthesia is indicated for practically all major operations below the diaphragm, as it induces a perfect anesthesia with complete muscular relaxation and gives a degree of safety which equals or surpasses that obtained from the administration of a general anesthetic. It protects the patient against impulses from the field of operation, thereby abolishing or very greatly reducing the amount of shock associated with long surgical operations. Due to the fall in blood pressure, there is much less hemorrhage at the time of operation and less tendency to secondary hemorrhage.

Rapidity.—By the time the patient's skin has been painted with iodine and the surgeon has put on his gloves, that is, from three to five minutes, the patient is ready for operation.

In abdominal and pelvic surgery spinal anesthesia finds its greatest field of usefulness. The complete relaxation of the abdominal walls allows the surgeon to operate through a smaller incision. The contracted condition of the intestines reduces the handling of sensitive viscera to a minimum. There is no protrusion of the bowels through the incision, as so often happens with other anesthesia. Intestinal distention is often relieved by the increased peristalsis resulting from paralysis of its inhibitory fibres. This, together with relaxation of the sphincter ani, is often responsible for the immediate emptying of the bowel while the patient is on the operating table. Functional intestinal obstruction has been entirely relieved by an intradural injection alone.[5]

Pelvic surgery, especially, is facilitated by the extreme relaxation of the abdominal muscles. Deep-seated organs may be explored more easily with a patient under its influence than with any form of general anesthesia.

Prostatectomy.—The reduced functional capacity of the kidneys, together with the great relaxation obtained under spinal anesthesia, recommends it as a most valuable aid in this department of surgery.

Smith[3] reports two hundred and fifty cases of which one hundred and one received spinal anesthesia. The gross mortality for the series was 18.8 per cent. The mortality in the spinal anesthesia series was 21.4 per cent. He states that the trouble was with the patient and not with the anesthetic and further explains that if ether or gas oxygen instead of spinal anesthesia had been given to this particular type of patient, they would have died in even greater numbers. In spite of his high mortality he believes that spinal anesthesia is a safe and most satisfactory anesthetic.

Also, it is practical in cases of stricture,[10] especially in those patients where there has been an over-distended bladder for a long time and a kidney function reduced below normal. In these cases ether adds to the unfavorable prognosis; with spinal anesthesia the stricture can be cut, the patient can immediately begin to drink water and the prognosis thereby helped. Meredith F. Campbell of Bellevue Hospital, after 536 inductions, states, "For our work, urological surgeons, it is the ideal anesthetic."

Kidneys.—Disease of these organs, even a mild case of nephritis, may be made much worse by general anesthesia. Spinal anesthesia having practically no effect on the kidneys, is indicated in these conditions.

Pregnancy.—As no nerve connection exists between mother and child, it follows that the child is not affected when the mother's pain sense is inhibited or blocked off by spinal anesthesia. The child cries as soon as born and does not show any effects of the anesthetic. Hemorrhage at the time of delivery is lessened and the tendency to secondary hemorrhage is not increased.

The relaxation of the muscles of the perineum is complete and lacerations of these parts are reduced to a minimum.

When used during labor, low lumbar injections do not materially influence uterine contractions. However, labor is retarded because of the paralysis of the lower abdominal muscles. Therefore, spinal anesthesia is indicated in complicated obstetrics, but as yet there is no indication for its use in lessening the pain of a normal delivery.

Doctor Polak, discussing eclampsia in a recent

article, states that inhalation anesthesia is a great contributor to the increased mortality and whether delivery is to be made by Cesarean or instrumental aid, spinal anesthesia is the only form to use and by using this the mortality is decreased 31% over the mortality of inhalation anesthesia.

Lungs.—As this anesthetic has no effect on the lungs it is indicated in all those patients suffering from active infection of the respiratory tract, recent or latent pulmonary tuberculosis and asthma.

Diabetes.—The use of general anesthetics increases the blood sugar. Very little increase is noted after spinal anesthesia.

Cardio-Vascular System.—Patients with valvular heart disease as well as those with high blood pressure act favorably under this form of anesthesia.

Fractures.—Open or closed reduction of fractures is facilitated by the complete muscular relaxation of spinal anesthesia.

Age.—Spinal anesthesia may be used in patients of all ages.

CONTRAINDICATIONS

Spinal anesthesia, because of its greater danger, should not be used where local anesthesia will suffice, or for operations of a few minutes' duration, not requiring muscular relaxation. These may be performed under gas, ethylene, or gas oxygen with greater safety to the patient.

It should not be induced if there is dangerous hypotension from shock or hemorrhage. In these conditions the blood pressure is too low to stand the further reduction which spinal anesthesia causes. With a systolic blood pressure of less than one hundred millimeters of mercury, it is considered unsafe to use this form of anesthesia.

In valvular heart disease associated with decompensation the patients do not react favorably to the drop in blood pressure and the slowing of the pulse.

In recent untreated syphilis or when this disease in any way involves the nervous system: these individuals having had a subarachnoid injection may attribute all subsequent symptoms to the spinal puncture.

FAILURES

The percentage of failures following the induction of spinal anesthesia varies greatly with different operators. That they do occur, after every step in the technique has been carefully carried out, is evident. Eliminating anatomical defects, they are usually due to some technical error, probably the most frequent one being an imperfect puncture of the dura, the flange of the needle only partially entering it. This permits the escape of cerebrospinal fluid, but when the injection is made most of the anesthetic fluid escapes extra durally. However, in most of the failures, there is some degree of anesthesia and a satisfactory anesthesia may be obtained by giving the patient enough gas or ether to dim consciousness.

MORTALITY

In reviewing the literature of this subject, the author finds that the mortality statistics vary so widely that no reasonably accurate index can be obtained.

Higgins[12] reports two fatalities in fifteen hundred cases. Boyd and Yount[13] six thousand two hundred and twenty-nine cases with four deaths. Rood[14] eight thousand cases and four deaths. Jonnesco[15] reports no deaths in a series of two thousand four hundred and thirty-six cases. Babcock divides his cases into three periods. In the first five thousand cases, ten anesthetic deaths occurred, nine patients died on the operating table and one two days after the injection. In the last two periods covering fifteen thousand patients, there was no anesthetic mortality. In these periods high spinal anesthesia was abandoned and the injection was withheld from patients in extremis.

C. C. Wells[15], in a summary of twenty-eight thousand seven hundred and forty-six injections, states that the mortality from 1908 to 1914 was 1-200; from 1915 to 1917 1-16,000. This suggests that the use of the newer and less toxic drugs combined with the refinement in technique which has occurred has greatly reduced the mortality from spinal anesthesia. It is now much less than the published statistics would indicate. However, many will continue to use spinal anesthesia only in those cases in which a general anesthetic is contraindicated. Of necessity, their mortality will continue high.

CONCLUSIONS

After having induced spinal anesthesia in about five hundred cases and after close association with many more hundreds of patients who have received subarachnoid injections for the induction of anesthesia, and a review of the literature on this subject, the author has arrived at the following conclusions:

That spinal anesthesia, in its present state of

development, is a safe procedure, having a mortality rate lower than that of general anesthesia, for major operations below the diaphragm;

That it improves the prognosis in a number of operations by allowing the surgeon to safely operate on patients who would probably die from the administration of ether or chloroform;

That abdominal and pelvic surgery is facilitated by the perfect analgesia and muscular relaxation obtained by the use of this method; and,

That the absence of postoperative symptoms, such as nausea and vomiting, gaseous distention, motor restlessness and kidney and lung complications, is of great advantage to the patient.

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A PARTIAL REVIEW OF THE PRESENT STATUS OF INJURIES TO THE BRAIN AND SPINAL CORD*

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The automobile and the increasing prevalence of motor-driven machinery have increased the incidence of injuries tremendously, and the brain and spinal cord have their propertionate share. Every medical man today should be capable of at least rendering intelligent first aid, and be sufficiently trained in diagnosis to know where to send these unfortunates.

The boast is often made concerning the recent advance in neural surgery. It is true that authors of twenty-five years ago thought more in terms of injury to the bony framework than in those of damage to the brain and cord. There has been practically no advance made in the surgical technique, except that brought about by the more general use of local anaesthesia, and to the use of motor-driven tools. The older authors even recognized that there were cases of injury to the brain without fractures to the skull. As for the spinal cord, what progress has been made is due largely to the use of the X-ray in diagnosis.

The greatest advance in brain surgery has come from a better knowledge of the pathology of acute injuries, and particularly as regards the part played by intracranial pressure. The conception of the latter has given the basis for surgical interference, and especially the necessity for opening the dura in any decompression operation. Till comparatively recently, the fear of sepsis and hernia of the brain prevented many from finishing what was otherwise an ideal operation.

The spectacular results often following elevation of depressed bone and removal of large epidural clots from the torn middle meningeal arteries, no doubt, were the factors that led to indiscriminate operating on all fractures. With the conception of intracranial pressure as being the chief factor in the morbidity and mortality the fracture became of much less interest, except those depressed and those causing middle meningeal hemorrhage. Massive brain injuries usually cause so much shock that these patients die before there is increased intracranial pressure sufficient for recognition. Also with the conception of intracranial pressure came an understanding of the mechanism of the symptom complex; namely, lowered pulse and respiratory rate, increased blood pressure, contracted pupils, papiledema, choked disks, and later that peculiar phenomenon, Cheyne's Stokes respiration. Clinically the sequence, high blood pressure, contracted pupils and choked disks, has been established by the use of the spinal manometer. Sharpe, all symptoms considered, even uses the intraspinal pressure as an indicator, for or against operative treatment.

Notwithstanding our better conception of the pathology, the actual application in practice is far from uniform. There is pretty general agreement as to what should be done, and the method. However, the line of demarkation between those to be conservatively handled, and those to be operated on, is very indistinct, and after all must be determined by the judgment of the individual

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surgeon. There is general agreement that no operation should be done during shock, and it is useless to do it in medullary edema (decompensation). All cases of depressed fractures and middle meningeal hemorrhage should be operated on, the former to prevent cortical irritation and later troublesome sequelæ, the latter, to prevent death.

Damage to the spinal cord, or at least the symptoms indicating it, has not received any very definite advice as to the proper management. There is general agreement that no operation should be done where there is severance of the cord, but none have been able to give any positive indication of this condition. All are uniform in the view that cord pressure for any length of time results in permanent damage. It is thought by most that the cauda will regenerate after pressure over prolonged periods of time, when decompressed.

Dr. Charles E. Dowman in a personal communication says, "We rely entirely upon the presence of actual pressure on the spinal cord as an indication for laminectomy. This can be determined by the application of jugular compression, with a simple tube manometer attached to the needle used for lumbar puncture. If there is no rise in the column of fluid on jugular compression there is an obstruction to the canal. We feel that laminectomy is indicated for the relief of pressure regardless of the neurological findings."

The method just described is no doubt the best possible guide for operative procedure. I have always thought that, in the presence of distinct indication of cord pressure, the treatment pursued was largely the result of personal courage. The man who has his reputation most in mind will hesitate and perhaps use the argument of blood clot pressure; the man who is most interested in giving the patient a chance will operate. The patient who dies as the result of a surgical operation for the relief of a damaged cord is indeed fortunate, for there is nothing more harrowing than the life of these hopeless cripples. Inasmuch as there is no way of distinguishing between complete severance of the cord and tight compresson, the spinal manometer indicating closure or severance of the canal, immediate operation should be the rule after giving reasonable time to combat shock.

I shall touch briefly on the outstanding features of acute and chronic brain injuries in adults, children, and the new-born.

Acute Brain Injuries in the Adult.—When we realize that one out of every three of these persons die, it is small wonder that surgeons are not keen to treat these cases. However, about 14% are in the class of massive brain injuries and die in about six hours, and as all are agreed that these should not be operated on, the mortality in those treated is about 19%. According to Sharpe 56% will not need surgery, other than tapping of the spinal canal. It can be seen from this that operative treatment is necessary in only a small number.

Dowman has a rather elaborate classification of these injuries, but by close study of them it can be seen that he and Sharpe are in close agreement concerning those requiring decompressive operations. Both advise operations on depressed fractures, and those producing middle meningeal hemorrhage. Both operate in the presence of evidence of increasing intracranial pressure not relieved by conservative management, and before the stage of medullary decompensation. Neither operate in the presence of shock.

In my search of the recent literature, which by no means is exhaustive, I have found none who makes himself so clear on what he regards as the indication for operative interference, as Sharpe. He advises operative treatment in those cases in whom rest, dehydration, and repeated spinal puncture drainage do not cause an abatement of the symptoms, and in whom papiledema is making its appearance, and the spinal mercury manometer registers twice the normal, that is 14 to 16 mm. of hg. Most of us are incapable of doing the ophthalmoscopic examination, but any of us can use the spinal manometer.

Dr. Walter Dandy of Baltimore read a paper before the Southern States Association of Railway Surgeons last November, in which he disagreed with the practice of spinal puncture, and the dehydration methods. His indication for operation is a continuance and progress of symptoms of intracranial pressure. His is almost a "let alone" policy other than the combating of shock, and other measures for the comfort of the patient. His article has not been published. I am, therefore, giving this from memory, and if I am not correct I stand ready to be corrected.

The operation of choice is subtemporal decompression. Operation is necessary in about 30% of those sustaining brain injuries.

Chronic Brain Injuries of Adults.—It is well known that many people who have had head in-

juries are not normal afterwards. There are all sorts of complaints, headache, dizziness, depression, irritability, change of personality, and neurosis, total about 67%. Many of these have been found to have chronic intracranial pressure as demonstrated by the ophthalmoscope and spinal manometer. Perhaps many of these can be prevented by better handling during the acute stage, keeping the pressure down, prolonged rest in bed, and earlier operation. No doubt a few can be benefited by late treatment. It has been found by operations and autopsy that some of these have the wet edematous brain, the result of interference with proper circulation about the brain-cortex, scarring, organized blood clots, and traumatic cysts.

Acute Brain Injuries in Children are managed in the same way as in adults. However, operation is necessary in only about 16%. This is thought to be due to the less frequent occurrence of cerebral edema.

Chronic Brain Injuries in Children.—It has been found that the younger the child sustaining brain injury, the more likely he will have symptoms of spastic paralysis, and mental retardation, not unlike those occurring from birth injuries. This is particularly true in those injured before three years of age. The use of thyroid and thymus therapy has been advised in some of these cases on account of its influence in retarding the secretion of cerebrospinal fluid. However, most of them are forced to decompressive operations, if there is any hope of relief, and this at best can only be partial. Operation in these cases has revealed chronic cerebral edema in many.

Acute Brain Injuries of the New-Born.—Sharpe has done considerable work along this line, and finds a great number of infants in the first days of life to have an increased intraspinal pressure, and the fluid often blood-tinged. There are varying symptoms presented, namely, drowsiness, inability to nurse, difficulty in taking food, muscular twitching, particularly about the orbit, and actual convulsions. The treatment is the same as that of the adults.

Chronic Brain Injuries in Children Resulting from Intracranial Hemorrhage at Birth.—These furnish most of the cases of Littles' Disease, cerebral spastic paralysis. This author in 1843 in his monograph on "The Deformities of the Human Frame" gave it as his opinion that most of these cases were due to lack of development and agenesis of the cerebral cortex, or from a former meningitis, but stated that he had seen a few that were apparently due to difficult labor. In his second monograph in 1862, "The Influence of Abnormal Parturition, Difficult Labors, etc., upon the Mental and Physical Condition of the Child," he stated that in his belief 75% are the result of intracranial hemorrhage at birth. This was overlooked till recently, only his former opinion prevailing.

The subject matter here follows largely the arrangement of Sharpe in his writings.

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AN INTERESTING CASE OF FRACTURE OF THE LEG TREATED WITH IMPROVISED SPLINT WITH GOOD RESULT*

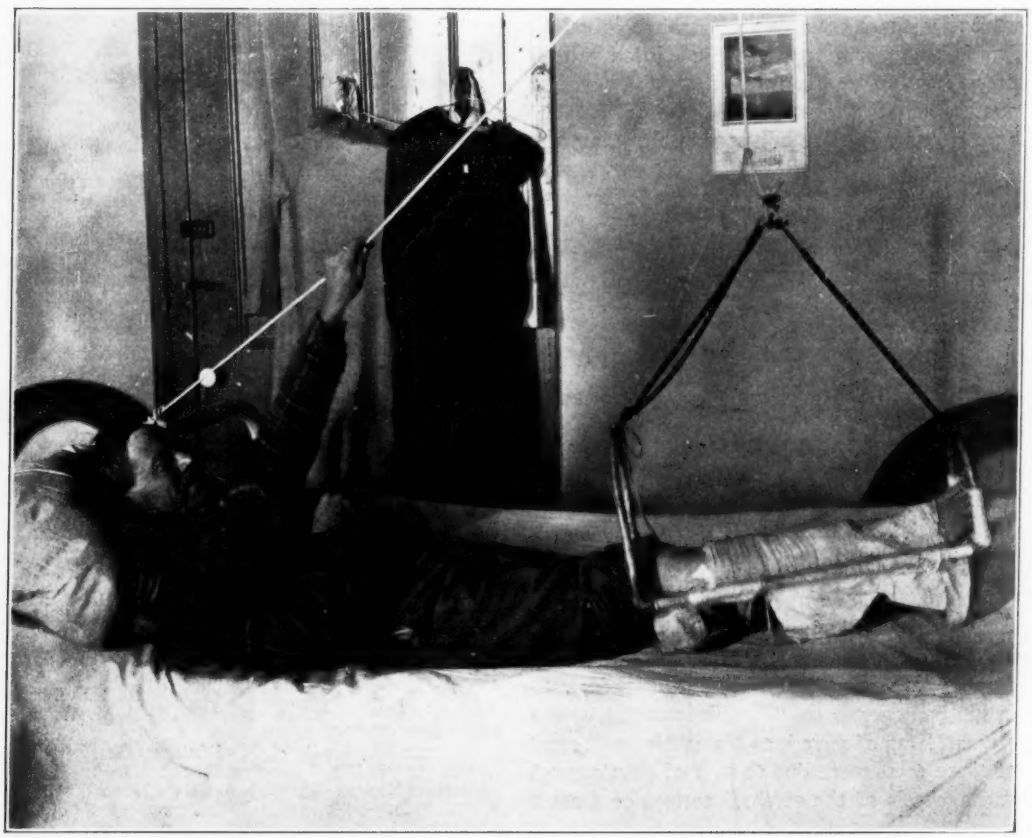
L. M. Anderson, M.D.,
Surgeon for Southern Railway,
Lake City.

I am reporting a case of compound, comminuted, multiple fracture of the right leg. On January 20, 1928, W. B. M., a white male, automobile mechanic, age 50 years, was run over by a wrecker and carried through a brick wall, fracturing the middle third and lower end of right tibia, with abrasion of about one-fourth of anterior surface of the leg. The fracture was dressed with wet Daiken solution, and wooden splints applied. The splints, which were used for protection only, were held in place by cotton packed on both sides with adhesive plaster at both knee and foot for extension. Wet dressings of Daiken solution were applied for three weeks until the abrasion healed, then wet saline dressings were used for three weeks longer.

The main splint was made of half-inch iron pipe with spiral springs at each end. The cloth was attached with safety pins to hold the leg. This splint arrangement was attached to a pulley with a rope and the rope fastened to the head of the bed for the convenience and use of the patient. In this way, he was able to dress his own leg, change his position, use pan, etc.

The patient is now walking on crutches, and using his leg to some extent. The leg is in perfect position, with no shortening or deformity. I have seen no other splint like this. I do not know if there ever was a splint like this in use.

*Read before the 9th Annual Meeting of the Florida Railway Surgeons' Association, Tampa, April 2, 1928.



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KNOW YOUR CANDIDATE

Medical men are ever reluctant to indulge in active political participations. This seems good and well at most times. However, there are occasions when candidates are definitely for or against those things that directly concern and without which our medical science cannot exist. The June election in our state presents an opportunity for medical men to vote for candidates who are for or against certain issues that concern organized medicine.

The teaching of the scientific theories of evolution in our higher institutions of learning is as necessary as the teaching of the so-called germ theory. The abolition of teaching certain phases of evolution is a certain retrogression in our educational system. Are we going to permit state officers to be elected who are determined to suppress the teaching of evolutional theories in our higher educational institutions?

Another point well worth considering is one that has previously been mentioned in our papers.

namely, that of the erection and operation of a state tuberculosis hospital for which the legislature has provided funds. The present state administration has for some unknown reason not made any endeavor to hasten the work. It seems that many other state projects have been crowded to completion while the erecting of an institution for the care of the suffering tuberculosis must wait.

Let us determine what our various candidates expect to do about these projects before casting our ballots in the coming election. Know how your candidate stands on these various medical questions before voting.

RECENT MEDICAL DISCOVERIES

Twenty-two additions to medical knowledge which may be expected to have important bearings upon future practice are described by George E. Coleman of the William Hooper Foundation for Medical Research, in a pamphlet just published by the American Association for Medical Progress.

One of the most picturesque discoveries noted in "Some Medical Discoveries of 1927" is the successful treatment of paresis by inoculating the patient with malaria. The treatment is based on the fact that the paresis parasite is highly sensitive to heat. Malaria induces high fever; hence the fever can be used to destroy the paresis germ, and then the malaria can be cured by quinine. For this discovery Prof. Julius Wagner-Jauregg, of Vienna, was awarded the 1927 Nobel prize.

Dr. J. J. Abel, of John Hopkins University, produced what appears to be a crystalline form of insulin, a deficiency of which substance is the cause of diabetes. The discovery of "myrtillin," a drug derived from a Siamese plant, for the treatment of diabetes was announced by Dr. F. M. Allen, of Morristown, N. J. Dr. K. E. Birkhaug, of Rochester, developed a curative antitoxin for erysipelas.

Several dietary discoveries were announced, the chief of which is the use of liver to cure pernicious anemia, as demonstrated by Drs. Minot and Murphy of Harvard. Prof. L. J. Meyer, of the University of Berlin, demonstrated the presence of vitamin C in milk; the absence of this vitamin from the diet brings on scurvy. Research workers in Massachusetts General Hospital found a special reduced diet of value in treating epileptic children. Dr. A. F. Hess of New York found dried milk treated with ultra-violet light useful in preventing rickets in babies.

In the University of Chicago Dr. W. H. Taliaferro reported progress in developing a serum for fighting the African sleeping sickness, and Dr. Florence B. Seibert made important discoveries about the chemical nature of tuberculin. Scientists in Berlin discovered changes in animal tissue due to the action of arsenic, which may have an important bearing on the problem of cancer. The Germans also are experimenting with an improved antiseptic, "avertin."

PROCEEDINGS OF THE NINTH ANNUAL MEETING OF THE FLORIDA RAILWAY SURGEONS' ASSOCIATION

The Ninth Annual Meeting of the Florida Railway Surgeons' Association was held at Tampa in the Music Room of the Tampa Bay Hotel, April 2, 1928.

The meeting called to order at 10 a. m. by L. S. Oppenheimer, M. D., chairman of Committee on Arrangements. After the invocation by Rabbi R. B. Hershon, an address of welcome was delivered by W. P. Adamson, M.D., of Tampa and the response was by J. H. Pierpont, M.D., of Pensacola.

The presidential address by J. S. Turberville, M.D., of Century entitled "A Partial Review of the Present Status of Injuries to the Brain and Spinal Cord," was delivered at this time.

The president assumed the chair and 47 new members were elected, bringing the membership up to 197, an especially good showing, since there are only a few over 200 surgeons of railways in the state.

(*Continued on page 584*)

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Resolutions of sympathy and friendship for C. B. McKinnon, M.D., of Marianna, who has been critically ill for a long time, were passed.

It was moved by J. H. Pittman, M.D., of West Palm Beach, and carried, that any member more than three years in arrears in dues be dropped from the membership roster after due notice, but that he has the right, and is urged, to pay up and reinstate himself at any time.

Papers read at the scientific session consisted of the following:

"Railway Fractures" (illustrated) by Joseph Halton, M.D., Sarasota.

"An Interesting Case of Fracture of the Leg Treated with Improvised Splint with Good Results," by L. M. Anderson, M.D., Lake City.

"Spinal Anæsthesia," by Wm. N. Parkinson, M.D., Chief Surgeon, F. E. C. Railway, St. Augustine.

The election of officers resulted as follows:

President, L. M. Anderson, M.D., Lake City.

Vice-President, J. M. Dell, M.D., Gainesville.

Secretary-Treasurer, E. W. Warren, M.D., Palatka (elected at St. Petersburg meeting for four-year term).

The following committees have been appointed by President Anderson:

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J. S. Turberville, M.D.....Century

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H. A. Leavitt, M.D.....Miami
G. C. Tillman, M.D.,.....Gainesville

ARRANGEMENTS COMMITTEE

Wm. N. Parkinson, M.D., *Chairman*, St. Augustine, together with all other surgeons in St. Johns County.

Next meeting will be held at St. Augustine on the day preceding that of the Florida Medical Association. This was conceded to be in many ways the best meeting ever held by the Florida Railway Surgeons' Association.

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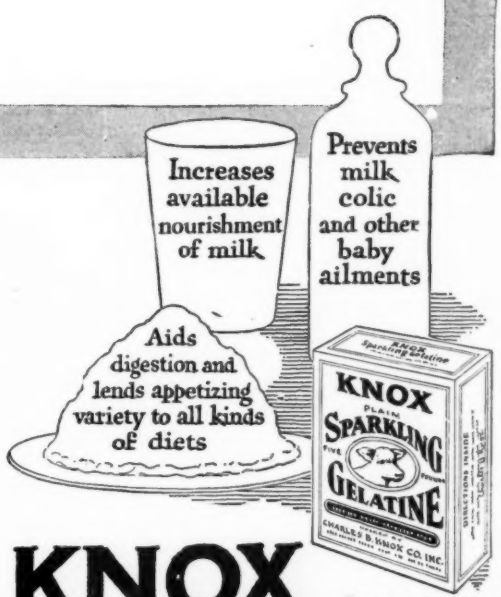
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STATE NEWS ITEMS.

The Florida Department of the American Legion, at its 1928 annual conference, voted unanimously to undertake a survey or census of every crippled person and blind person within the state. They realize that in order to do this they must enlist the aid of every civic and welfare organization possible. Those engaged in health work come in contact with a large percentage of our disabled population. You are urgently requested to report the name and address of every crippled person whom you know, to the nearest Legion Post Commander. Your assistance will materially help the Legion in this worthy undertaking. It is the wish of the State Department of the American Legion to foster a movement which will eventually result in adequate provision for treatment and rehabilitation for every disabled person through the state.

For detailed information write to the State Child Welfare Committee of the American Legion of Florida: Judge W. S. Criswell, Chairman, 101 Law Exchange Building, Jacksonville, Florida.

* * *

The Suwannee River Medical Society met in Madison Friday evening, April 13, 1928. Dr. T. S. Anderson of Live Oak, the president, presided over the meeting. Drs. George O. Davis and D. H. Yates read interesting papers on "Hemorrhagic Malarial Fever" and "High Blood Pressure." The papers brought about a general discussion. It was set forth that hemorrhagic malarial fever was almost a disease of the past with improved sanitation and mosquito control, and that the climate of the State of Florida was unsurpassed for people suffering with high blood pressure.

Drs. L. M. Anderson and R. B. Harkness of Lake City reported some of the things of interest that occurred at the State meeting in Tampa. The society adjourned to meet in Live Oak on May 11, 1928.

The doctors present were: T. H. Bates, R. B. Harkness, P. C. Farnell, L. M. Anderson, Herbert Caldwell, J. D. Gable, J. H. Dyer and L. J. Arnold of Lake City; T. S. Anderson and H. M. Strickland of Live Oak; Eustace Long, George O. Davis, A. L. Blalock, D. H. Yates and B. F. Hamrick of Madison; J. C. Ellis and R. J. Green

(*Continued on page 588*)

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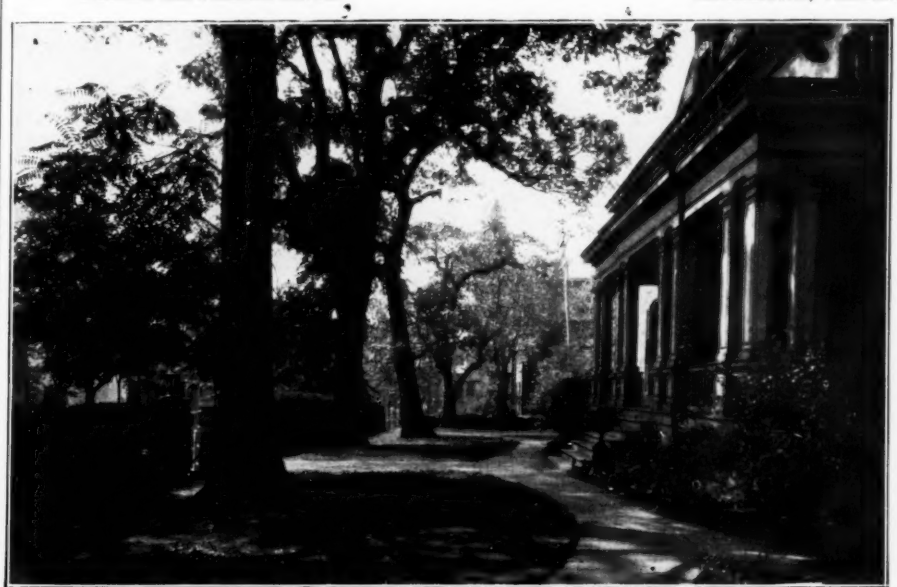

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of Perry; R. E. Dicks of Dowling Park; J. P. Kinsey of Pinetta, and J. R. Bruce of Jasper.

* * *

Dr. Marshall Taylor, Jacksonville, has just returned from Washington, D. C., where he attended the Fiftieth Annual Meeting of the American Laryngological Association. Dr. Taylor this year was elected a member of the American Otological Association.

* * *

During the month of April, the following program was presented by the Pinellas County Medical Society:

"Medical Ethics," Dr. H. L. Putnam, St. Petersburg.

"Treatment of Superficial Malignancies," Dr. J. A. Herring, St. Petersburg.

"Bladder Tumors," Dr. G. Timberlake, St. Petersburg.

"Cardio-spasm," Dr. W. G. Post, St. Petersburg.

"Rectal Anesthesia in Obstetrics," Dr. E. A. Heibner, St. Petersburg.

* * *

The May meeting of the Duval County Medical Society was held May 1st at the new St. Vincent's Hospital by invitation of the Board of Directors of the Hospital. A gratifying increase in attendance was noted. Following the Scientific Program of the evening, refreshments were served by the Hospital.

* * *

One of the features of the opening of the new St. Vincent's Hospital, Jacksonville, has been the organization of the Ladies' Auxiliary. The Auxiliary has held two meetings to perfect the organization and they hope to have a thousand members. The plan is to hold monthly meetings on the first Tuesday morning of each month, and they have selected as one of their first tasks the beautification of the Hospital grounds.

Officers elected for the Auxiliary are as follows: Honorary President, Sister Mary Louise; President, Mrs. F. J. Waas; Vice-President, Mrs. J. K. McIver; Secretary, Mrs. Vincent Armstrong; Treasurer, Mrs. Frank Adams.

* * *

Dr. Kenneth Morris, Jacksonville, is taking post-graduate work in surgery in the northern centers. At present, he is pursuing a six months' course at the University of Pennsylvania.

(*Continued on page 590*)

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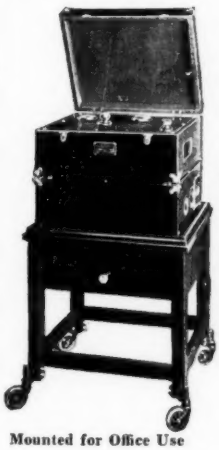

Mounted for Office Use

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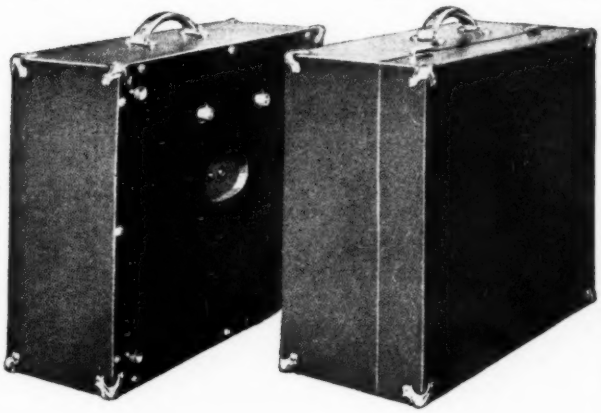
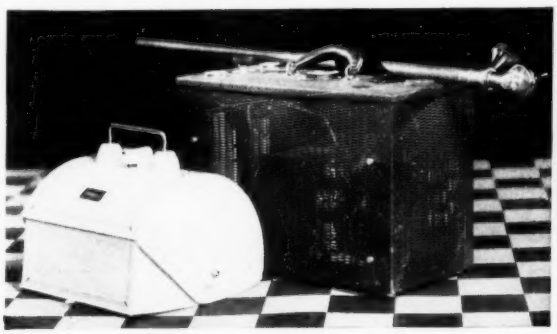
PORTABLE DIATHERMY APPARATUS



GROUND FREE

The High Tension Portable is absolutely ground free and shock proof. There is no possibility of the patient or operator receiving an electric shock from the apparatus as no part of the circuits is grounded.

The High Tension is the only portable high frequency built with an OIL IMMERSED transformer.



New Burdick Portable Quartz Lamp Dismounted

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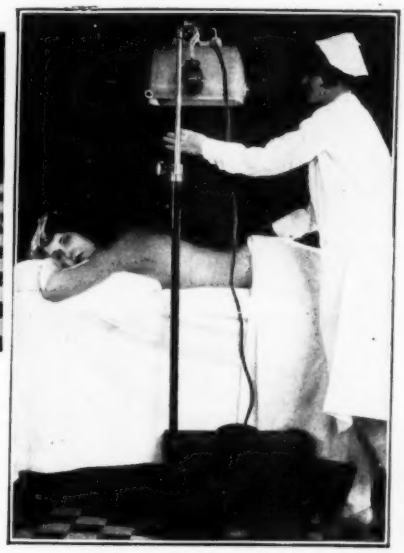

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Kindly give me full particulars on:
Portable diathermy apparatus
Portable Quartz Light

Dr. .....

Address .....

We take our hats off to the members of the Florida Medical Association from Arcadia. They attended the Tampa meeting 100% strong.

* * *

Dr. F. S. Jennings of St. Petersburg has recently gone to Dryden, New York, where he will spend the summer, returning to St. Petersburg about October 1st.

* * *

Dr. J. M. Hoffman of Pensacola recently spent two weeks in New Orleans.

* * *

The new St. Vincent's Hospital of Jacksonville, costing approximately $1,000,000.00, was opened to the public April 12th. During the opening day, several thousand visitors were shown through this modern institution. Several days previous to the opening the patients were moved from the old hospital to the new.

* * *

The Good Samaritan and the Pine Ridge hospitals of Palm Beach were recently approved by the American Medical Association.

* * *

The regular monthly meeting of the Columbia County Medical Society was held April 2nd at the Blanche Hotel in Lake City. The Society passed a resolution commending the city commission for their action in having a preliminary survey made for the extension and improvement of sanitary sewerage system for Lake City. Dr. L. M. Anderson read a paper entitled "Cooperation and Coordination of the Medical Society with Local, State and Federal Public Health Bodies."

* * *

The following hospitals in Jacksonville have been accredited by the American Medical Association: St. Luke's, St. Vincent's, Duval County, Riverside, Rollins Hospital of Obstetrics, and Brewster's, the latter being an institution for negroes.

* * *

Mrs. W. Lassiter, past president of the Woman's Auxiliary of the Florida Medical Association, recently visited Tampa and assisted in organizing a local chapter for Hillsboro County. It is hoped that the Hillsboro chapter will become a very active one as there is much good work that they can accomplish in their county.

(*Continued on page 592*)

The only way you can visit Rochester, Minn. en route to or from the A. M. A. Convention without extra cost.

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are supplemented by modifying the milk with Mellin's Food, the additional mineral matter consisting of *potassium, calcium, sodium, magnesium, phosphatic salts and iron;* all in a form readily utilized for the development of bone structure and for the regulation of various functions of the body.

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PLEASE MENTION THE JOURNAL WHEN WRITING TO ADVERTISERS

The many friends of Dr. W. McL. Shaw of Jacksonville will regret to learn of the death of his father, W. F. Shaw, at the family home in Sumter, South Carolina, April 28th. Mr. Shaw is survived by his widow and two sons, W. F. Shaw, Jr., and Dr. W. McL. Shaw of Jacksonville.

* * *

WANTED—We have several well-trained practical laboratory technicians with additional training in physiotherapy graduating from our school of public health May 15; physicians, hospitals, clinics, and health departments desiring such service can secure it by writing immediately. Address, Dr. L. H. South, Director Bureau Bacteriology, Kentucky State Board of Health, 532 West Main Street, Louisville, Ky.

* * *

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

of THE JOURNAL OF THE FLORIDA MEDICAL ASSOCIATION, INC., published monthly at Jacksonville, Florida, for April 1, 1928.

STATE OF FLORIDA, } ss.
COUNTY OF DUVAL. }

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared Shaler Richardson, M.D., who, having been duly sworn according to law, deposes and says that he is the editor of the JOURNAL OF THE FLORIDA MEDICAL ASSOCIATION, INC., and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Name of Publisher, Florida Medical Association, Inc. Post office address, Box 81, Jacksonville, Fla.

Editor, Shaler Richardson, M.D. Post office address Box 81, Jacksonville, Fla.

Managing Editor. None.

Business Manager, Stewart G. Thompson, D.P.H. Post office address, Box 81, Jacksonville, Fla.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent or more of the total amount of stock should be given.) A corporation—not for profit.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

FLORIDA MEDICAL ASSOCIATION, INC.,
By Shaler Richardson,
Editor.

Sworn to and subscribed before me this 17th day of April, 1928.
S. G. Thompson,
(SEAL) Notary Public State of Florida at Large.
(My commission expires April 9, 1932.)

Form 3526.—Ed. 1922.

NOTE.—This statement must be made in duplicate and both copies delivered by the publisher to the postmaster, who shall send one copy to the Third Assistant Postmaster General (Division of Classification), Washington, D. C., and retain the other in the files of the post office. The publisher must publish a copy of this statement in the second issue printed next after its filing.

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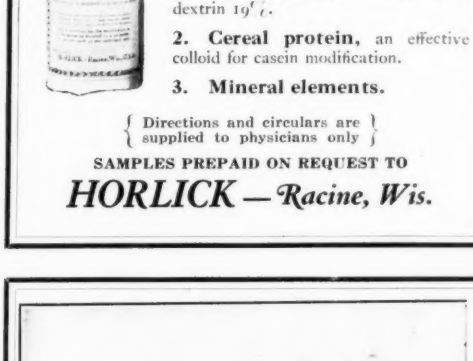

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